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AN AIR RECONNAISSANCE OF THE HADHRAMAUT: *A paper read at the Evening Meeting of the Society on 15 December 1930, by*

SQUADRON-LEADER THE HON. R. A. COCHRANE, A.F.C.

THE following description of the Hadhramaut has been written as the result of an air reconnaissance which was carried out from Aden in November 1929. On some maps the word "Hadhramaut" is printed over a wide strip of Southern Arabia, but in this description it is applied to one particular valley some 300 miles long which runs parallel to the south coast of Arabia, until it breaks through the coastal mountains and reaches the sea at Saihut, 450 miles east of Aden.

The feature which first strikes one on looking at a map is the extraordinary isolation of this valley. To the north and north-east it is bounded by the "Empty Quarter," or Rub' al Khali, which no European has yet crossed, and which forms a complete barrier even to the nomadic tribes of Central Arabia. To the west it is separated by arid plateaux and deserts from its nearest neighbour Yemen, with which little if any intercourse takes place. There remains the south, but even here it is far more isolated than a mere 100 miles of mountain range would lead one to suppose, for the practicable tracks are few and so beset with difficulties that undesirable intruders could easily be stopped unless they came in very large numbers. Such are the surroundings of this fertile valley.

The whole of the Hadhramaut originally belonged to the Kathiri tribe of Southern Arabian stock, but towards the close of the fifteenth century disputes arose among members of the ruling family; and one of the rivals called in the assistance of the Yafa'i tribe, who live near Aden. As a result fighting between the two sections was continuous for many years and there is still friction. At present the Kathiri own the eastern portion of the Hadhramaut with the chief towns of Saiwun and Tarim, while their rivals the Ku'aiti own the western portion and the two ports of Shihr and Mukalla, through which passes all the trade of the Hadhramaut.

Before starting on the reconnaissance we tried to find some one in Aden who had actually visited the Hadhramaut, but although nearly every one had heard of it, and could tell stories of the wealth of the inhabitants, and the castles in

which they live, it was extremely difficult to get any definite information. Luckily Mr. and Mrs. Theodore Bent, who visited the western part in 1894, have left an excellent account of their adventures.* But neither they nor the explorer Hirsch, who tried in the previous year to enter in disguise, were allowed to see the Kathiri towns of the Eastern Hadhramaut. Curiously enough the best description of the country and the manners and customs of the inhabitants, is a Dutch Government work published by the Government of Batavia in 1886.† The entire book with its maps and diagrams was written in the Dutch East Indies from descriptions supplied to the author by Arabs from the Hadhramaut who migrate there in large numbers. This emigration is the natural result of the barriers which surround their valley and which prevent the surplus population from finding an outlet into other parts of Arabia.

As a starting-point for the reconnaissance we made use of a landing ground near Mukalla, which is a well-built town nestling round the edge of a small bay. This gives sheltered anchorage to dhows in the winter, but it is too exposed to be used except for a few hours a day during the summer when the south-west monsoon is blowing. In spite of these limitations it is surprising to see the quantity of merchandise in the sheds, which is an indication of the numbers and wealth of the peoples in the interior.

The flight reached Mukalla at the end of October and immediately set to work exploring and photographing the country within a radius of 150 miles, but more particularly along the Wadi Hadhramaut itself. One of the principal difficulties encountered was the identification of the various towns and villages, since very few of these are marked on any map. Luckily a willing helper was found in Saiyid Abu Bakr, the Sultan's Wazir, who volunteered to act as an observer. He seemed to regard flying as quite a normal thing and had no difficulty in identifying the names of the villages in the main wadi. The Wazir was a well-educated man, but even the ordinary Badawin from the desert has a wonderful sense of direction in the air, and can pick up landmarks without difficulty.

In order to give a general impression of the country I think that I had better follow the route of one of the reconnaissances. Starting off on a north-westerly course one strikes the western entrance to the Wadi Hadhramaut after some 120 miles. The wadi here trends north-east, but gradually bends round in a sweeping curve to south-east, then back to east, and finally to south for its break through the coastal mountains some 140 miles east of Mukalla. During the whole time we were at Mukalla visibility was excellent, and from the air the outline of mountain ranges could generally be seen at distances up to 80 miles, and large towns or areas of cultivation at 20–30 miles. The best time of day for visibility was the early morning, because then the air has that wonderful quality of clearness which one only gets in desert countries when the sand carried up by the previous day's heat has settled.

Starting off on a flight it was necessary to climb rapidly to 6000 feet to clear the Coastal Range of mountains. This range is a continuation of the great cliff wall which is such a feature of the eastern part of the Aden Protectorate;

*Theodore and Mrs. Theodore Bent, 'Southern Arabia,' 1900.

†Van den Berg, 'Le Hadhramaut et les Colonies Arabes dan l'archipel indien,' 1886.

Photographs by Flight-Lt. A. R. M. Rickards. Published by permission of the Air Ministry

Country south of Wadi Hadhramaut

Robat and Khuraiba villages at head of Wadi Du'an

curiously however the cliffs here do not face south, but east and north-east, and are very much broken up. This cliff face proved most useful later in fixing the position of some of the towns in the Eastern Hadhramaut, since it was possible to take a bearing of it when well within sight of the Hadhramaut. The climb to the pass only takes twenty-five minutes by air, so one can sympathize with the Bents who took four exhausting days to reach the summit. This point is the watershed, and the country slopes gently to the north, from 6000 feet to 2400 feet in the floor of the Hadhramaut at Shibam. The plateau is of quite extraordinary aspect. In describing it the Bents say: "Words cannot express the desolate aspect of this vast tableland, Akaba, or 'the going up,' as the Arabs call it. It is perfectly level and strewn with black lumps of basalt, looking as though a gigantic coal scuttle had been upset. Occasionally there rises up above the plain a flat-topped mound or ridge some 80 feet high, the last remnant of a higher level which is now fast disappearing." That is a view of the country from the ground; but from the air one can see that all round the track which the Bents followed the land is eaten away into the most intricate formations and patterns. The higher levels which they described stand out as flat-topped hills, some a mile or two across, but others only a few yards wide. It looks as though the country had been rained on by some corrosive liquid which, once it had eaten through the top protective layer, was able to bite deeply into the soft core underneath. The result is a maze of narrow canyons, some of which are 1000 feet or more deep, winding and twisting round the buttresses which still stand, though farther to the west the depressions are broad and shallow, and patches are cultivated by the Badawi. If one wanted to devise a particularly unpleasant death, I can think of nothing worse than to be dropped into the middle of this canyon maze and told to find one's way out; I don't think it would be long before one walked over a precipice.

This scenery continues for 35 miles until one comes to a particularly wide canyon, but so deep that it is not until the very edge is reached that one can see that the floor is a mass of date palms, and that villages are clustering on the slopes formed where the cliff walls have fallen. This is the Wadi Du'an, the most fertile tributary of the Hadhramaut. The main track from Mukalla, which we have been following, disappears into the chasm, but reappears again on the other bank, so one can pity the traveller who suddenly finds that to reach it he must scramble down 1000 feet of cliff, cross a few hundred yards of valley floor, and then laboriously climb out again before he can continue his journey. The villages in the wadi are built of sun-dried bricks which are so exactly the shade of the overhanging cliffs that quite considerable villages would pass unnoticed if it were not for the shadows cast by the windows and the angles of the walls.

Looking north the Wadi Du'an shows as a continuous line of palm trees with frequent villages, but after 15 miles they get scarcer as the wadi broadens out, and instead of date palms there is nothing but drift sand and dried mud. The water here is evidently too far underground to be reached by the ordinary wells. The last town of any size is Hajarain, built round the spurs of an isolated hillock in the middle of the wadi. Out of the centre of this island juts a hard core of rock, the top reaching almost to the level of the surrounding plateau and containing, I believe, some old Hamyiritic inscriptions. Below Hajarain the

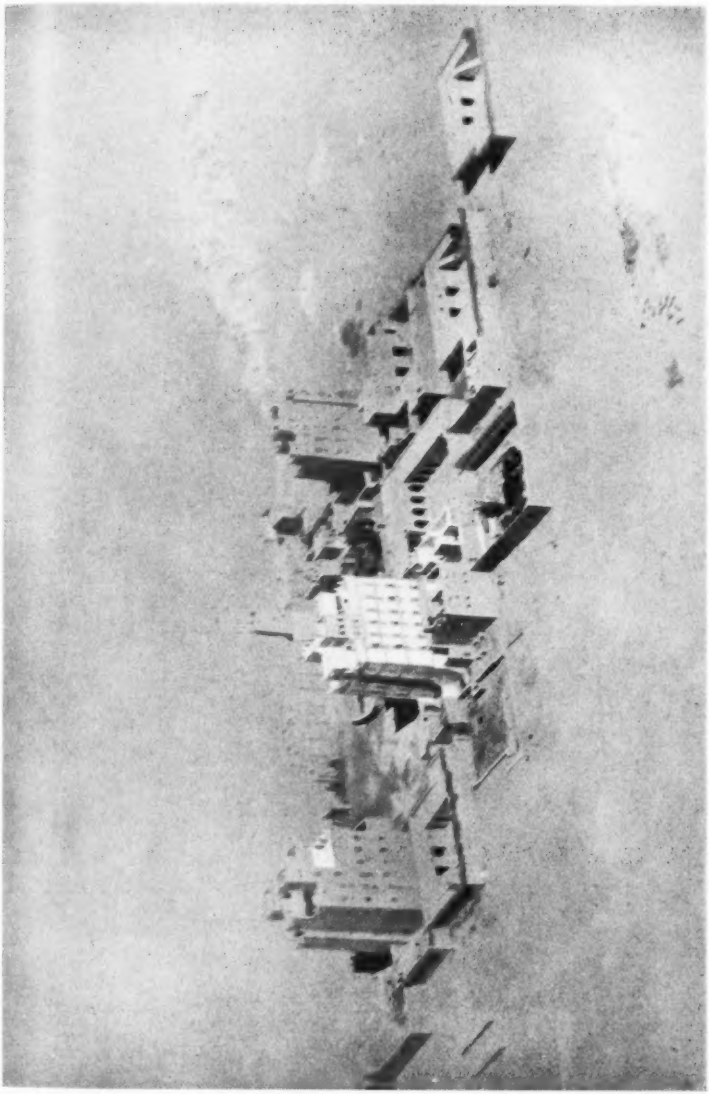
Robat and Khuraiba villages at head of Wadi Du'an

wadi widens to a mile or more, and was once the centre of the great trade in frankincense and myrrh, but it is now a sandy waste through which in places one can just see the faint outlines of ruined villages and irrigation ditches.

The Hadhramaut itself is now quite close and there is an opportunity for getting one of those first sudden views of a new country which are always so satisfying. As a rule it is very hard to get this sort of surprise view when flying, because unless one shuts one's eyes, which is considered dangerous, the landscape, even at 100 m.p.h., changes too slowly to give one any of the dramatic feeling of a sudden discovery. But natural features can help, and by flying down the Wadi Du'an at about 800 feet, that is below the level of the cliffs, one can get a first view of the Hadhramaut with all the suddenness which any one could wish. Ahead the northern horizon is completely shut in by a solid wall of rock rising out of a yellow sandy waste, the pockets of drift sand caught up on the lower ledges of rock giving the impression at this distance of waves breaking on a beach. To the right and left the view is bounded by the similar cliff walls of the Wadi Du'an, with a thin strip of green cultivation under each. In a few seconds they are left behind and one is out in the Wadi Hadhramaut itself. At this point the valley is some 4 to 6 miles wide and quite barren. Looking to the westward one can see the wadi gradually merging into a sandy desert, without any sign of cultivation, but directly below and to the east there are numerous villages under the cliffs on either side, each village surrounded by a patch of date palms and vivid green cultivation. Turning east one comes, after a few miles, to the first of those "castles" of the Hadhramaut which are one of its most interesting features. This one stands away from any cultivation, is six stories high, and with outbuildings must cover at least an acre of ground. It forms an impressive outpost to the richer country to the east, which can now be seen stretching in an almost unbroken line of date gardens as far as the wadi is visible. The southern cliff is here much broken up by numerous side valleys, so that it now resembles a line of promontories rather than a barrier. Nestling under the cliff of each promontory is a village surrounded by date palms, and containing well-built houses which are seldom less than three stories high.

The first big town is Shibam, standing four-square between high walls on a slight rise in the wadi bed near the southern cliff. The first and distant view is surprising enough, but a closer inspection shows that the need for protection can make houses grow tall quite as effectively as high ground rents. When one considers that the houses are mostly built of mud it seems an amazing feat to design them to withstand the weight of seven stories. As an indication of the wealth of these towns the Bents mention in their book that the Sultan of Shibam's father had left eleven million rupees to be divided among his numerous family.* The present Sultan's castle is a fine building standing in extensive date gardens. The next big town, Saiwun, is a complete contrast, for although it is surrounded by a wall, much of the town straggles outside it, and comfortable country villas lie dotted among the date palms. The main wadi still runs in a nearly straight line, but it has started to get narrower, and by the time that Tarim is reached it is barely half a mile wide. Here a subsidiary wadi with a small stream of running water comes in from the south, while the

* 'Southern Arabia,' p. 144.



Castle near Al Qatn

Hejarain

main wadi makes a wide sweep to the north before swinging east once more. Tarim lies under the north-western rim of the great bowl formed by this sweep. The town and a large area of gardens are enclosed by a high wall, strengthened at frequent intervals by towers, while inside these defences a number of detached houses and villas are dotted about, many of them with elaborate colonnades and verandas not usually seen in native architecture. The whole impression however is of a town which has seen more prosperous times, an impression which is heightened by a number of ruined castles standing in the wadi just below the town. This is the result of the fighting between the rival Kathiri and Ku'aiti, which continued until recent times. Even so, from the air Tarim with its neighbouring villages comes close to Saiwun as the largest town in the Hadhramaut, and it is certainly situated in the most attractive surroundings. Outside one of the big houses one is quite likely to see a motor car, which seems odd in a town which has never been visited by a European; but in recent years the demand for cars has been growing, and we were told in Mukalla that there are now some fifty or sixty in the Hadhramaut. They are taken to pieces at Mukalla, transported by camel across the mountains, and re-erected on arrival. Although the going may be soft there do not appear to be any serious obstacles in the way of driving a car anywhere in the inhabited portion of the Hadhramaut.

Below Tarim the wadi narrows to about a quarter of a mile and commences to wind vigorously. There is now a fair-sized stream of water running down the centre, but as there is no cultivation except at the very edges under the cliffs this water is presumably too brackish to be used for irrigation. Villages soon become scarcer, and the floor of the wadi covered with drift sand and tamarisk scrub. The last place of any importance is the village of Qabr Hud, containing the tomb of the Prophet Hud, and a curious whitewashed mosque built in three tiers up the hillside. The tomb is one of the most holy places in Southern Arabia and is an important place of pilgrimage at certain times of the year, when, according to Van den Berg, a great settling of tribal disputes takes place. Just beyond Qabr Hud a large valley branches off to the south, which can perhaps be identified with the valley of Borhout, in which is situated the famous Bir Borhout. This well is apparently anything from an active volcano to a witches' cauldron. According to El Kaswini* "It is a well of which the Prophet said 'in it are the souls of infidels and hypocrites,' and again, 'the most hateful district to God is the valley of Barahut in which is a well whose waters are black and foetid, where the souls of infidels make their abode.' " From the air nothing at all can be seen; but as the well is believed to be in a grotto under the cliff it might very easily be missed. The account of Mas'udi in the tenth century that it is the greatest volcano in the world, casting up immense masses of fire, can be dismissed as a fable. The nearest volcano, which is extinct, is at least 50 miles away.

After passing Qabr Hud, the valley turns south-east and runs nearly straight for 50 miles before it bends to the east once more. Along the whole of this stretch the valley is not more than a quarter of a mile wide, while the cliffs are very much eroded and less than 200 feet high. To the north one can see that in the extreme distance the desert rises into a range of hills, which, judged by

*S. Lane Poole, 'Arabian Society in the Middle Ages.'

the known heights of the Coastal Range in sight to the south, must be some 8000 feet high. The country in between is the same barren plateau, intersected by thousands of small canyons. In the wadi a little scrub grows along the banks of the stream, but apart from this there is no sign of cultivation and only a few scattered Badawi encampments.

Shortly after turning east the wadi gets into difficulties as it passes through the Coastal Range. It starts to twist and turn, to cut its way across spurs, and in places almost to burrow under them, since the cliffs rise to 2000 feet and quite overshadow the bed, which is frequently less than 100 yards wide. After 30 miles the wadi makes a sharp turn south, not south-east as shown on the maps, and makes its final break through the mountains to the coastal plain, which is here only a mile or two wide. The stream, which has been visible intermittently ever since Tarim, disappears under the sand some miles from the sea, but it is evidently not far underground as a number of villages are scattered across the coastal plain. The trip from here back along the 140 miles of coast to Mukalla is not very interesting, for the coast is one of extreme barrenness, full open to the swell of both the north-east and south-west monsoons, and without any sheltered water. It is not surprising therefore that it enjoys a very bad reputation among owners of dhows. One or two villages are of quite respectable size, but the height of the walls surrounding them gives some guide to the state of local society. Very few of these villages can boast any cultivation, but they live principally by fishing, and the acres of what appear from the air to be recently ploughed fields are in reality fish spread on the ground to dry.

A final word as to maps may be of interest. Air pilotage, as every one knows, is not yet an exact science, but flying in Arabia soon teaches one that it is often more exact than the maps available. In flying down the Hadhramaut our first doubts as to the accuracy of the maps were raised by our arrival at all the towns progressively sooner than we expected, the cumulative error becoming so great that Qabr Hud appeared to be some 30 miles west of the position shown on the map. We therefore determined to fix its position by the best methods available. To do this two aircraft started in the early morning when wind conditions might be expected to be uniform, climbed to 6000 feet over Mukalla, and set off on a circular trip, one *via* Saihut, Qabr Hud and back, and the other *via* Shibam and Qabr Hud. The whole trip was flown at a constant height and speed, while the compass courses, and the times flown on each course, were noted. From this data it was possible to work out the speed and direction of the wind, which in its turn enabled the bearing and distance between any two points passed over to be calculated. The results are naturally not accurate by surveying standards, but the positions of Qabr Hud obtained by the two aircraft were within 5 miles of each other, and this position was further checked by a bearing taken at a distance of 80 miles on the cliff face near Mukalla. If these figures are accepted Qabr Hud is some 35 miles west of the position shown on the 1/1,000,000 map, and Tarim some 15 miles west. The distances in the western half of the Hadhramaut appeared to be quite accurate, so it is interesting to speculate why these errors exist farther east. I believe that this may be due to the manner in which the valley winds about between Saiwun and Qabr Hud. The distances on the map were probably calculated—they certainly were by

Van den Berg—by the number of marches between points; so that if it was assumed by the map-maker that the valley was straight for its whole length from Haura to the sea, and he can have had no certain information that it was not, then Tarim and villages below it would be placed to the east of their true positions; since a trek of 100 miles down the valley would only cover some 60 miles in a straight line.

Shortly after the aircraft had returned to Aden the Hadhramaut was visited by Lieutenant-Colonel the Hon. T. M. Boscawen, who went there on a shooting trip from East Africa, accompanied by his servant, who was an Arab from the Hadhramaut. He travelled down the Wadi Du'an and along the Hadhramaut as far as Tarim, being very well received wherever he went. He reported that the flight of aircraft had caused much interest, and that the local chiefs were disappointed that no one had landed. Colonel Boscawen has now returned to East Africa, and I can only hope that he will be prevailed upon to write an account of his trip, since he would be able to give far more detailed and interesting information about the people than I can.

I find it difficult to sum up my impressions of the Hadhramaut, particularly as these impressions are only based on a few short flights over the area, helped to some extent by subsequent examination of the photographs. There is no doubt however that the Hadhramaut is a place which has a peculiar fascination; the mere fact that the greater part of it had never been seen by Europeans shows how isolated it is, yet although isolated, life there according to Arab standards is highly organized and prosperous. The mere existence of such a valley tucked away in a fold of the "Empty Quarter" gives rise to many conjectures. Where, for instance, does the water come from? Is the very meagre rainfall on the coastal mountains sufficient, or is there some other source? Then the shape of the wadi: there can be few river-beds in the world which are 4 miles wide at their source and gradually dwindle away into an insignificant streamlet at the sea. To an observer in the air it looks as though the wadi once ran the other way; but perhaps modern knowledge could supply a satisfactory answer.

There is no doubt that the country is now much more civilized than it was when the Bents undertook their journey in 1894, but although motor cars are now common, and the towns have been peered at from the air, I think it will be many years before the Hadhramaut loses its isolation or the peculiar attraction which this lends it.

DISCUSSION

Before the paper the PRESIDENT (Admiral Sir WILLIAM GOODENOUGH) said: Hadhramaut is a portion of South Arabia which lies behind a ridge of hills separating it from the sea. It has another name, but that I leave the lecturer to describe to you. Squadron-Leader Cochrane, after having suffered for a short time as a midshipman under my command, turned his attention to the air, and there he has carried out his duty with success and distinction. Very few have been into the interior of the Hadhramaut. Mr. and Mrs. Theodore Bent were there in 1894; Mr. Hirsch has also been there, and another, namely, Mr. Lee Warner, who is present this evening.

After having joined the Air Service Squadron-Leader Cochrane found himself at Aden, and from there he carried out a reconnaissance over the country which I will now ask him to describe.

Squadron-Leader Cochrane then read the paper printed above.

Mr. LEE WARNER: (*See p.* 217)

The PRESIDENT: As there is no one else who can speak on the subject, I would add that after Mr. Bent's lecture some years ago Mr. Dyer, who spoke in the discussion, said that Mr. Bent had stirred the imagination of his audience. You, Sir, and Mr. Lee Warner have stirred our imagination to-night. It is agreeable to find that whereas Mr. Bent met with every conceivable official obstruction in getting to the Hadhramaut, the reconnaissance about which we have heard this evening was organized and carried out by a Government department. I do not know whether it is quite proper for a scientific society to congratulate a State department, but I risk it, and we do congratulate the department concerned on its progress.

The Hadhramaut is very interesting country, and I hope that the fact that the Arabs there have become accustomed to aircraft will enable aircraft to go inland and to land at Tarim or Shibam, and thus be able to make explorations from local places which will enable us to find out much more about the country and to carry out more detailed geographical research than I imagine Squadron-Leader Cochrane found possible. It is not only the face of the country however that he has been able to show us by means of the photographs, but also, in those taken by Colonel Boscawen, the people, who have been so ably described by Mr. Lee Warner. These various interests add much to our enjoyment and knowledge. I will ask you, Squadron-Leader Cochrane, to accept our very best thanks not only for your most interesting lecture, but also for the charming photographs you have shown us, and I would go so far as to ask you to convey to the Air Ministry the congratulations that we offer to them upon having some one who had carried out their work so ably. Finally, I hope you will not consider this too public a place to offer you our congratulations upon a dual flight which I understand you propose to take next Monday.

NOTES ON THE HADHRAMAUT: *Expanded from his contribution to the discussion on the preceding paper by*

W. H. LEE WARNER

A FEW observations on the Hadhramaut, ancient and modern, may be of interest in amplification of Squadron-Leader Cochrane's most fascinating account of his air reconnaissance of the eastern end of the main wadi.

§ 1. As Professor J. L. Myres points out, the first phase of the three chief steps of human advancement is represented by the civilizations of the great river valleys—Hwang Ho, Ganges, Euphrates and Tigris, Nile, etc. Doubtless, in a smaller degree, the same phase occurred in the main and, at that distant date, fertile valley, the great Wadi Masila or Wadi Hadhramaut; taking this wadi as originally running from or near Marib (north-east of Yemen) through Shabwa—famous, later, for its salt mines—past the present towns of Shibam, Saiwun, and Tarim, and then bending south-east down to the sea at Saihut. The gigantic ruins of the irrigation dams at Marib testify to the advance of the desert sand. So far back as 950 B.C. we read of a Queen Balkhis of Saba visiting Solomon; and from inscriptions it is known that the Makarib ruled at Sirwah from the ninth until the sixth century B.C., when the kings of the Sabaeans succeeded them at Marib, with power extending throughout the Wadi Hadhramaut, until they in turn were defeated by the Himyarites (*circa* 115 B.C.). In Genesis x. 26 we read of Hazarmaveth, son of Joktan: and tradition still maintains the latter, through Yarab bin Kahtan, as the progenitor of the South Arabian tribes; while in his father's name are reproduced the very characters of the word Hadhramaut (H-D-R-M-W-T), later corrupted into the form Chatramitae by the Greeks. The famed incense-bearing lands of the Sabaeans, the source of myrrh and frankincense, were in all probability centred round Hajarain in Wadi Du'an; and the need of these fragrant resins enhanced the importance which the Wadi Hadhramaut already possessed as the highway, or one of the highways, for the Far Eastern trade (India and perhaps even China) to Egypt, Cnossos, and the Eastern Mediterranean littorals. Prior to the Ptolemaic development of sea-borne traffic methods, the land route by the Wadi Hadhramaut, thence along the eastern littoral of the Red Sea, and so to Egypt and Palestine, was the great trade highway, or one of the great trade highways. It is of interest to note that within an area of a few miles, in Wadi Du'an, without any excavation, a Sabaean seal, an Assyrian bronze winged horse, a piece of jade shaped like a small axehead, and a beautifully modelled Greek bronze Apollo, all came to light. All around Mashad, in the Wadi Du'an, a few miles north of Hajarain, are scattered broken pieces of marble and stone, inscribed with the most beautiful Sabaean or Himyar inscriptions. One of these, weighing a hundredweight, was brought home and is now in the British Museum.

So much for ancient interests in the Hadhramaut.

§ 2 (A). The next point for notice is the people who inhabit the country. There is, so far, no reason to believe that the descendants of Joktan were ever expelled from their original home in and round the fertile wadi, cut off by high plateaux and twisting defiles from the south, bordered on the north by the

Rub' al Khali ("the empty quarter") the great Arabian Desert, and vulnerable only to attacks from the extreme west (the present Yemen) or from the south-east (*via* Saihut), attacks which, to be successful, in either case would call for expert guides, large forces, extreme courage and endurance, and a commissariat system which would need to be of the highest order. Aelius Gallus, sent by Augustus to subdue inland Southern Arabia, failed to reach the Hadhramaut, being deceived by his guides. Since the introduction of Islam the character of the people has changed little, if at all, a fanatic dislike of the "unbeliever" and an inherited pride of descent engendering an exclusiveness which von Wrede in 1846 attempted to break down, but failed. In 1893 Leo Hirsch reached Tarim, but was forced to retire to the coast; in 1894 Mr. and Mrs. Theodore Bent reached Shibam, a town whose authentic history of continuous occupation can be proved for at least 2500 years; towards the end of the War the present writer traversed the whole length of the Wadi Du'an and penetrated to a few miles beyond the Ku'aiti outskirts of Shibam. These, till the year 1929, were the only Europeans to gain any insight, from actual contact, into the inhabitants and into the nature of the country.

The primitive and typical self-government, dating from the oldest times, is still preserved, and in its present form embraces a population sharply divided into four classes: (*a*) the Saiyids, supreme, as of pure descent from Husain, the prophet's son-in-law; (*b*) the tribes; (*c*) the townsfolk and cultivators; and (*d*) the slave population.

The Hadhrami Saiyids are deeply respected and are grouped in varying numbers of families throughout the towns and in the wadis. They consider themselves as undoubtedly of the very purest blood and of direct descent from the daughter of the Prophet, and they most jealously resent any inter-marriage save with the bluest of blue Islamic blood. A local community of Saiyids is obedient to its Mansib and so late even as 1918 the Wazir of the Sultan of Mukalla, though in point of fact the actual ruler of Wadi Du'an, besides being the Sultan's prime minister, did not hesitate to state that he looked on the Mansib of Huwaira—a local saint (so great was the veneration in which he was held)—as his spiritual and mental director. The Saiyids bear no arms and, owning as they do large bodies of slaves and the most fertile pieces of land, need not occupy themselves with any bodily labour. They exercise a very strong influence both in religious matters and in local politics, and are often appealed to as arbitrators in the case of tribal quarrels or clan disputes.

The tribesmen are the bearers of arms. No self-respecting tribesman (and their self-esteem is by no means small) feels that he comes to manhood unless and until he possesses and carries a rifle. Each tribe acknowledges as its head a tribal lord, or Muqaddam, the families being in turn each under its headman or "Father." Many of the tribesmen now live in settled communities although the nomad pursuits of their ancestors still govern the existence of others. The *ghaziya* however is by now practically non-existent throughout the Hadhramaut, its final death blow coming in 1918, when the leading chiefs of the strong Hamumi tribe were by treachery inveigled inside the walls of Shihr to be murdered in cold blood.

The townsfolk are the unarmed tax-paying merchants, citizens, agriculturists, and workers, whose safety depends on and is guaranteed by the tribes

who guard them. In return for such protection they pay taxes, their protectors having the sense to avoid imposing any exorbitant levy which might drive the victims to seeking protection under a neighbouring and/or rival tribe.

Of recent times, when the preponderating power of the Ku'aiti Sultan of Mukalla has reduced the inhabitants of the western wadis (Wadi 'Amd, Wadi Du'an, Wadi 'Ain) and of the main Wadi Hadhramaut as far as Shibam to a condition of "free subservience," and the wealth (in armed slaves) of the two Kathiri Sultans has done the same to the tribesmen and townsfolk between Gharaf and Tarim and Ainat, it may be said that taxation is now in the main paid to the Sultans in a far greater proportion and to a far greater extent than some decades ago, when the tribes enjoyed the major share. The Ku'aiti and Kathiri rulers take care however not to overstep the bounds of what is considered in the main just and equitable: (*a*) in the matter of amount to be paid by the townsfolk; and (*b*) in the matter of apportionment of such amount paid between themselves and the respective tribal leaders.

The lowest class, that of the slaves, is—so repute has it—on the whole very well treated. The exceptions might be the young Chinese girls who are still brought into the country as occasion offers, and when the opportunity occurs to escape the precautions of the authorities at the ports of export. Their fair complexion appears to present great attractions to the swarthy Arabs of the Hadhrami towns, and more than one Saiyid, revered as a saint, has been smitten by their charms. Such girls are "converted" to Islam, and in all probability never leave the wadi again. Formerly, the supply of male slaves had always been adequately provided from Africa; but the vigilance of our Red Sea patrols during the last fifty years has resulted in the successful termination of what was a well-organized and highly remunerative business. There is no doubt that the Hadhramis' love of isolation was in the past partially induced and fostered by the knowledge which every Hadhrami possessed who went abroad to gain his living, that the white Kufar (unbelievers) were in world-wide league to stamp out slavery. At the same time it must be admitted that of the many thousands of male slaves and male slave descendants still in the Hadhramaut wadis and towns no inconsiderable number have risen and do rise to positions of trust and responsibility, while their cheerful attitude to life bespeaks an existence unclouded by cruelty on the part of their owners.

§ 2 (B). Such being the people, it may be asked why the Hadhramis are that section of the many Arab races and communities which very closely interests the British. The reason is that the Hadhramaut being unable to provide sufficient sustenance for its large population, the Hadhrami has from early days been forced to go oversea and to seek not only a living for himself but to carry on the family tradition of remitting home annually such moneys as will enable his relations to purchase those necessities (and often those luxuries) of life which cannot be produced locally.

The Hadhramis, in the main, have emigrated, and do emigrate, in three considerable streams: (*a*) to Hyderabad; (*b*) to Dar-es-Salaam and the East African Littoral; and (*c*) to the Straits Settlements and the Netherlands East Indies. With Hyderabad their connection is intimate, since the command of the Nizam's bodyguard is held by the Ku'aiti Sultan of Mukalla as hereditary Jemadar: with Zanzibar a close connection has been held for hundreds of

years; while as for the Straits Settlements, it is calculated that over 95 per cent. of the important Arab element is Hadhrami. Whole streets in Singapore and Penang are owned by wealthy Hadhramis, mainly of the Kathiri tribes. The same, and even more so, is the case in the Netherlands East Indies, where the teeming Muslim populations, ignorant and apt to flare up in a blaze, render great respect and veneration to the pure blood of Islam as seen in the Hadhrami Saiyids. In fact, it was due solely to the importance, politically no less than materially, of this Arab element that the Netherlands East Indies Government commissioned one of its civilians, Van den Berg, to prepare a full account of the Hadhramaut, of its inhabitants, towns, and life, and of their influence throughout Java. His book,* laboriously, meticulously, and most ably compiled from ceaseless examination of numerous Hadhramis, is almost as true of present conditions in the Hadhramaut as it doubtless was when it was published, and it is intensely interesting to note on the spot, in the very wadi itself, how accurately Van den Berg performed his task of describing the Hadhramaut and the Hadhramis at a distance of over 4000 miles from Arabia.

In Aristotelian phraseology: "Of the social divisions of the Hadhramis and of their slaves let so much then have been said."

§ 3. A few remarks on water supply, agriculture, and cultivation in Wadi Hadhramaut and Wadi Du'an.

From the distant west, as far as Rada' east of Yemen and Marib to the north-east of that province, the water, drained from the Great Yemen mountain shelf, must have poured down in the far distant past along the line of the Great Wadi Hadhramaut, past Shabwa, till it reached the site where the Ku'aiti town of Al Qatn now stands at the point where Wadi Du'an debouches into the main Wadi Masila or Hadhramaut. Thence it flowed east, past Shibam, Tarim, and Ainat, finally curving in a south-eastern bend down to the sea at the point where Saihut is now marked on the map. In distant ages a stream sometimes 4 miles wide must have torn for itself a course between the high sand plateaux which still mark its ancient limits. No European has ever ventured *west* from the northern end of Wadi Du'an, but the native account states that from Al Qatn to Shabwa is some 170 miles, the track leading past Sarr, and Qa'outha, to the Thukmain chain of hills, across a desert entirely barren and unpopulated. It would probably be quite feasible to effect this journey in a caterpillar car of the type so successfully used by the French in the Sahara, and ultimately to disclose the romantic secrets of Shabwa, the former capital, and of the farther stages up to Marib and its famous dams. To the east however from Al Qatn, water is available and, for the last few miles before reaching Shibam, available in no small quantity. In 1918 the planting out of over 200,000 date palms had just been completed, and held every prospect of success. Set out in straight lines, each young tree in a dug-out circle of its own, the growth seemed uniform and promising. Of the plantations east of Shibam and up to Tarim Squadron-Leader Cochrane has already given an adequate description. The main point is that in this, the main wadi, cultivation does not depend on local rainfall, whereas 10 miles south (in Wadi Du'an) it entirely so depends. As he travels up Wadi Du'an the visitor will notice what

*'Le Hadhramaut et les Colonies Arabes dans l'archipel Indien,' par L. W. C. van den Berg. Batavia: Imprimerie du Gouvernement, 1886.

Shibam, chief town of the Kuʿaiti

Tarom, chief town of the Kathiri, showing wall enclosing gardens and valley outside the town

appears to be an enormous borrow-pit running alongside the track edge in such portions of the wadi as admit of any attempt at cultivation. In such spots he will see rough fields already scratched by the plough, each field enclosed by a mud wall, exactly like the *batas* on Malay ricefields. The cultivator, having thus prepared his fields, then awaits the *sail*—that is to say, the longed-for downpour, which, falling over the high plateaux, drains rapidly off into the wadi, is assembled in the wayside "borrow-pit," and thence rushes foaming along, pouring out into numberless small cross irrigation channels its precious fluid. From these channels the water enters the fields: without delay the dhurra (barley) and other quick-maturing seeds are planted; and without any further water-supply the plant grows, matures, fruits, and is reaped within a period of seven to eight weeks. When the present writer went up the Wadi Du'an no rain had fallen for sixteen months, but when he reached Hajarain ("the two rocks") he was blessed by fortune, as a bountiful downpour occurred, and the Naha tribe ceased their murmurings at this advent of an unbeliever, and welcomed him on its occurrence as warmly as they had scowled at him the evening before.

Of the agricultural products grown in Wadi Hadhramaut, round Shibam, and through the Kathiri Territory, mention may be made of indigo, sesame, millet, dhurra, and wheat; and lucerne in some places for fodder. Dates are cultivated wherever possible and are the staple food—the female being fructified by hand: men climbing the trees and shaking the pollen over the female spathes. The date palm is to the Hadhrami what the coconut palm is to the Malay or to the Siamese: every portion of the tree and fruit is usable, and is used, for the satisfaction of the daily needs. From the date flowers bees collect the most delicious honey. Hadhrami honey was famous even in Pliny's day, and continues to be one of the few exports from the Hadhramaut. It is packed in large round tins, and favoured recipients are sometimes embarrassed by the generosity of the donor. In spite of the prevalent want and distress throughout the Hadhramaut during the 1914–1918 War a Badawi chief insisted on the writer taking with him tins holding some 90 lbs. of this honey, a gift which ultimately reached London and proved of great use.

Brief mention must be made of tobacco. At Ghail Ba Wazir (of which town Squadron-Leader Cochrane showed a fine photograph) is grown the famous Hamumi tobacco, greedily sought after up the whole Red Sea Littoral. There are several most picturesque lime caves outside the town whose cavities shelter flocks of wild pigeon; the water therein is startlingly blue, and is drawn to the tobacco fields by deep-cut drains of very great antiquity, exactly resembling the Persian Kanats with their frequent and symmetrical "man holes," permitting of inspection and cleaning at a depth sometimes of over 20 feet. The town of Ghail Ba Wazir is strongly walled and the tobacco godowns occupy a large area. The whole oasis belongs to the Sultan of Mukalla, who farms the entire crop annually to a group of Bombay Parsis, who live within the town in a condition of some magnificence. The annual return to His Highness was put at a lakh: the crop is not very large, but the quality is considered exquisite.

It is hoped that the above items of information, however roughly expressed,

may yet amplify from the point of view of the pedestrian the far more fascinating pictures of the Hadhramaut culled by Squadron-Leader Cochrane from the air. In his lecture he stated that his party was astonished "by arriving in their flight at all the towns progressively sooner than expected." The pedestrian in the Hadhramaut never suffers from such unexpected joy. The tortuous windings of the defiles, the barren stone-strewn sand of the high plateaux, and the scorching daytime heat invariably seem to throw the longed-for well or the promised village farther and farther away. But in spite of its discomforts, its enormous "bugs," and the impossibility of any ablutions when on the march, the Hadhramaut exercises an almost overpowering fascination. It is in many ways unique, both in the ways of nature and in the smaller ways of men; and it contains within itself, unrifled hitherto, entrancing secrets of the past glories of Sabaean and Himyar.

The Hadhrami, who in youth has sought his living in Singapore or in Surabaya, and who for years, having amassed a large fortune, has enjoyed every luxury which money can provide, will in his old age return, if so be it is possible, to his mud-built town in Wadi Du'an or Wadi 'Ain, to Shibam or Tarim or Saiwun, cheerfully laughing at the discomforts of the way, eagerly yearning to regain his fatherland, and praying to the Prophet that his wish may be granted and his return allowed. And just as the dwellers in Nejd sigh in exile for their balmy uplands and "the sweets of the meadows of Nejd": "Ah! Heaven's blessing on the scented gales of Nejd, and its greensward and groves glittering from the spring shower"; so, with no less a longing, the Hadhrami turns to his remote villages, though the famed and scented balm-lands of ancient times are now denuded of their fragrant resins, and myrrh and frankincense are now *im*ported and not *ex*ported.

NOTE.—At Fort de Koek, above Padang, on Sumatra's west coast, there occurs an extraordinary series of chasms, called the "Kerbauen-gat" (or Buffalo's Way). These resemble almost startlingly the wadis of the Hadhramaut, both in the extreme abruptness with which the side wadi grows from a tiny crack to a frowning and dangerous cleft, and in the immense width of the main wadi, in the centre of which now runs only a tiny stream.

THE ENCLOSURE AND PARTIAL RECLAMATION OF THE ZUIDER ZEE: *A paper read at the Evening Meeting of the Society on 12 January 1931, by*

PROFESSOR J. W. THIERRY

1. The Reasons for the Undertaking

IN order to gain a general impression of the real significance of the works relative to the enclosure and partial reclamation of the Zuider Zee at present in course of execution, I may be allowed to devote first some consideration to the economic position of the Netherlands.

Within its coast-line the Kingdom of the Netherlands has an area of 15,700 square miles, of which 12,600 square miles are land; the remainder is water. The eastern and south-eastern higher part (45 per cent.) of the country is a diluvial formation, deposited in the south by the prehistoric Rhine, Maas, and Schelde, and in the east by the Scandinavian glaciers during the last glacial period. The soil consists chiefly of sand, loam, and gravel. The western and northern lower part (55 per cent.) is an alluvial formation, deposited from prehistoric times by the same rivers and the sea up till now. The soil is composed of clay, peat, and sea sand. Forty per cent. of the total area of the land is below the level of high floods, and 25 per cent. even below mean sea-level. These parts have to be protected against the sea by banks.

In former days the land was higher; the present condition is the result of a slow gradual subsidence, estimated at 8 inches per century. The inhabitants have adapted themselves to the process, but this meant a bitter and very long fight against the invading sea. At first, by lack of adequate organization and of technical knowledge, only loss of land was sustained. The formation of the Wadden Zee (the northern part of the Zuider Zee) probably commenced a few centuries before the Roman period; the Zuider Zee came into existence for the greater part between 1100 and 1300. Already, before this period, the resistance of the inhabitants began to take effect, and they succeeded in reconquering some lost land. After 1400 the losses decreased notably, and about 1500 the odds were even. The total area of the lost lands up to then, as far as can be retraced, amounted, roughly estimated, to between 1600 and 1800 square miles. At that moment the issue of the contest was settled in principle: the gain began to surpass the loss, and since 1600 an area of about 1300 to 1400 square miles has been reconquered. At present there is practically no loss any more.

The Netherlands are situated very favourably in the north-west of Europe, as a corner house at the meeting of the two busiest thoroughfares of this continent—the Rhine and the North Sea—and as a sea gate of the rich industrial districts of Central Europe. This situation from very remote times developed navigation and commerce, and also the instinct of colonization; and, favoured by a mild and wet climate and a very fertile soil, the freedom-loving inhabitants soon made agriculture another important means of subsistence.

Nevertheless, the produce of the soil is not sufficient to feed the population; a large part of the food has to be imported. And the Netherlands being a small country with very few natural resources, she cannot be self-supporting: the total of the above-mentioned and other imports largely surpasses the total of

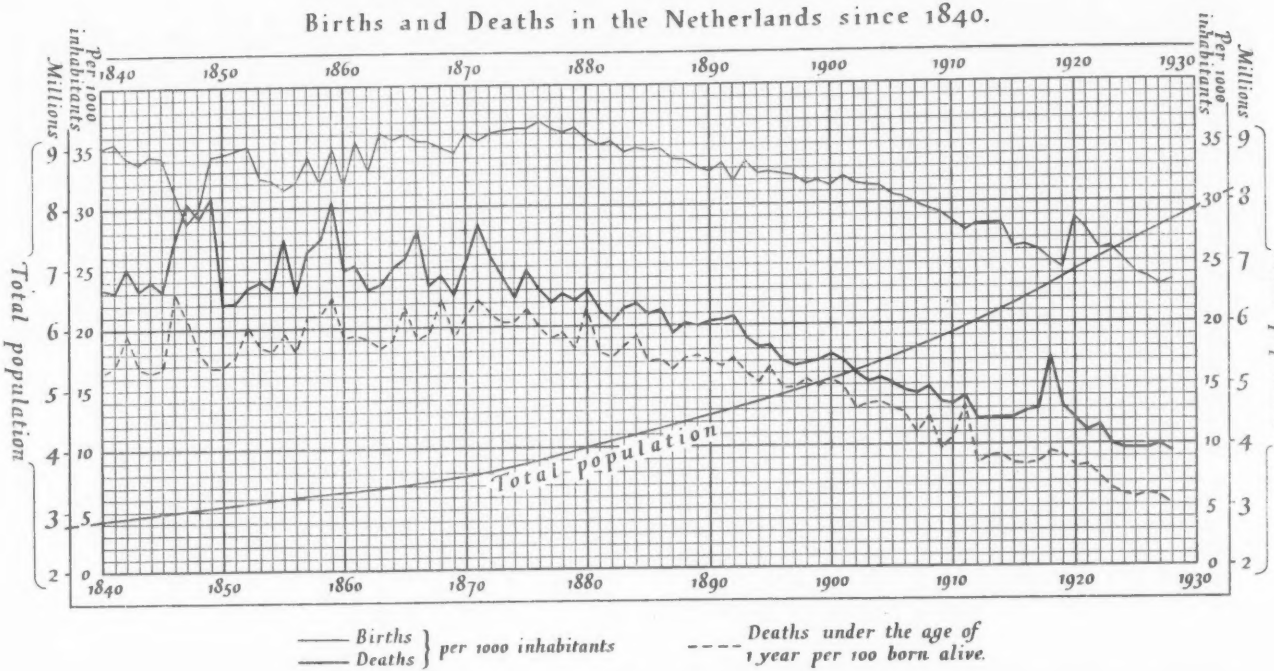

Births and Deaths in the Netherlands since 1840.
Per 1000 inhabitants
Millions
Total population
1840
1850
1860
1870
1880
1890
1900
1910
1920
1930
Total population
Births
Deaths
per 1000 inhabitants
Deaths under the age of 1 year per 100 born alive.

Fig. 1

the exports. In 1928 the imports amounted to £227,000,000 and the exports to £166,000,000, leaving a deficit on the trade balance of £61,000,000. This deficit must be made up for by participation of the country in world trade, and by the profits of navigation and investments in colonial and foreign enterprise.

In commerce and transport 10 per cent. of the whole population is employed. Of the ocean steamers (ships of 5000 net registered tons and more) 6·4 per cent. fly the Dutch flag, and of the total world's tonnage the Netherlands possess 4½ per cent. against the United Kingdom's 30 per cent. and the U.S.A. 15½ per cent.

Rotterdam, with neighbouring ports along the New Waterway, was in 1929 the second seaport of Europe with a clearance of 25 million tons against London's 26 millions, while the total clearance of Dutch seaports was 30 million tons. The tonnage of international river navigation (Rhine, Maas, Schelde) amounted to 54 million metric tons.

As a colonial power, the Netherlands occupy the third place, England and France preceding, with a colonial asset, mostly in Asia, of 780,000 square miles, with 65 million inhabitants. The value of the export from the Dutch East Indies amounted to more than £100 millions in 1928.

Notwithstanding all this the deficit of the trade balance is increasing. The prosperity of the Netherlands is largely dependent on export, *i.e.* the possibilities of import into other countries and their prosperity and purchasing power. This is a delicate situation, the more so in periods of crisis such as we are experiencing at present, and especially when everywhere the tariff walls are raised higher and higher, and England and Holland remain practically the only free-trade countries in the world.

Fig 1

And above all, Holland is over-populated to a large extent, and the population is still growing fast. On the 12,600 square miles of land more than 7,800,000 people are living, *i.e.* 620 per square mile. It is true the birth rate is decreasing (from 31·5 per thousand in 1900 to 22·8 in 1929), but Holland is a healthy country, and the death rate is decreasing still more (from 17·9 per thousand in 1900 to 10·7 in 1929), and leaves an average surplus for the years 1925–1929 of more than 100,000 per annum.

To fight the evil effects of over-population the usual expedient is industrialization. But this presents difficulties in a country where nearly all the raw materials must be imported. Besides, we have already gone far that way: 12 per cent. of the whole population is employed in industry. The value of its annual production amounts to nearly £110 millions, of which the better half is exported. It is doubtful whether this amount can be increased much within a short time. Another means was emigration. I need not remark here that this expedient is of little avail at present.

And lastly there remains the increase of the production of the soil. It has been pointed out that the Netherlands have very few natural resources: the soil only yields coal and a very small quantity of salt. The coal production is increasing fast: from 6·7 million tons in 1925 (320 tons per underground worker) to 10·7 million tons in 1928 (440 tons per underground worker); but the increase cannot go on indefinitely, and the absolute value of the increase will not amount to much.

More is to be expected from increasing the agricultural production: (*a*) By

Fig. 2. Sketch-map of the Netherlands showing the plan for the enclosure and partial reclamation of the Zuider Zee

intensifying cultivation; but this method has its limits, which have already been reached for some of the crops. And it demands a larger import of fertilizers.

(*b*) By extension of market gardening at the expense of agriculture. But this trade again is largely dependent on export.

(*c*) By extension of the cultivated area, namely, by bringing waste land into cultivation or by reclaiming land.

At present 1,880,000 acres (*i.e.* 23 per cent. of the total area of the land) is still uncultivated. Of this surface 840,000 acres are occupied by buildings, roads, canals, and other works of public utility, increasing on an average by more than 4000 acres each year. On the other side 1,040,000 acres are waste land, mostly sandy soil; only a relatively small part of this area is fit for cultivation, and the remainder at the best for afforestation.

From 1910 till 1927 the cultivated area was increased by 4 per cent., while in the same period the population grew with 30 per cent. Over-population is not found only in the towns, but the countryside also is over-populated. According to the diverse methods of farming there exists for each different region and soil in the country an optimum area of holdings. In most parts of the cultivated area the younger generation of farmers cannot acquire enough land to start for themselves, and consequently are obliged to be content with holdings too small for economic exploitation. The efficiency of the farming business suffers perceptibly from this situation. Consequently the purchase price as well as the rent of the land has risen far too high in proportion to the productive value.

The shortage of arable land is most strongly felt in the districts of the heavy rich clay and the pasture grounds, which have the nearest resemblance to the soils to be reclaimed from the Zuider Zee.

To remedy this very undesirable situation there remains only the last possibility: land reclamation on a large scale. So in Holland for the present and the next generation the slogan will have to be: More land—and at any cost. This is the fundamental reason why the enclosure and partial reclamation of the Zuider Zee is being executed.

II. The Plan of the Works

In March 1918, when the fierceness of the war along our frontiers had reached its climax, a bill pertaining to the execution of the Zuider Zee works was voted in the Dutch Second Chamber. In June it passed the First Chamber. At first sight it may seem queer that such a decision involving an outlay of so many millions of pounds was taken at such a moment, with a future more uncertain than ever before. But the decision was taken under the influence of the inundations of January 1916, when 32,000 acres of land were flooded in consequence of the rupture of some of the Zuider Zee banks during a storm tide—an event which will be prevented in future by the enclosing dam. And besides, the country had felt strongly its lack of independence and of self-supporting power, especially during the second half of the Great War; if we could then have had at our disposal the 550,000 acres of arable land which are being reclaimed at present, there would have been far fewer difficulties for us. The works were started in 1920, but owing to the financial crisis it was only in 1926 that we put our backs into it.

The Zuider Zee is an inland sea penetrating far into the land. It was formed

in historical times by gradual enlargement of the then existing Flevo lake. The southern part, or Zuider Zee proper, has a somewhat even bottom with a depth of 8 to 15 feet beneath low water. By a funnel-shaped transition between the lines Enkhuizen–Stavoren and Wieringen–Zurig, this part communicates with the northern part or Wadden Zee: a region of mud flats and sand shoals lying between low- and high-water mark, and intersected by channels and creeks in part rather deep. The Wadden Zee is separated from the North Sea by a chain of islands, remnants of the former coast. In the deep channels between the islands the tide runs in and out.

The southern part has the character of a tideless sea (tidal range 8 inches to 1 foot); the area however being large, a considerable quantity of water flows in and out twice a day. In the northern part the tidal range is larger; on account of the network of channels the tidal movement is very complicated.

Besides the water drained by gravitation or by pumping plants from the low districts around the coast, the Zuider Zee is charged with the inflow of several small rivers and one larger, the Ijsel, a branch of the Rhine, with a normal discharge of nearly 8000 cubic feet per second. This river carries large quantities of silt and sand, which are deposited chiefly near its mouth in the Zuider Zee.

A number of plans have been made, some of them dating from eighty years ago. The scheme now in course of execution does not differ in essentials from the forty-years-old plan of the late Dr. C. Lely. The Zuider Zee is to be enclosed along the southern limit of the Wadden Zee by a huge enclosing dam from Van Ewijksluis to Wieringen and from Wieringen to the Frisian coast near Zurig (south of Harlingen).

The enclosed area measures 915,000 acres, of which four parts (*polders*), altogether 550,000 acres, are to be embanked and drained separately. This is about one-third of the area of Lincolnshire, and 10 per cent. of the existing cultivated area of the Netherlands. In the centre, the Ijsel lake, a lake of 270,000 acres, will be left, where the sand and silt of the Ijsel can settle. Through the discharge of this river, within a few years it will become a freshwater lake.

The Ijsel lake will discharge its surplus water into the Wadden Zee twice a day at low water through a number of sluices in the enclosing dam, to maintain a normal level of 1 foot 4 inches below N.A.P. (Normaal Amsterdamsch Peil, the Dutch Datum). During high storm tides the discharge may be obstructed for a period of four and a half days. The dimensions of the Ijsel lake have been calculated so that if such a period were to coincide with the highest possible discharge of the Ijsel (approximately 110,000 cubic feet per second), the level of the lake would not rise to more than 3 feet 4 inches above N.A.P. This destination as a storage lake during periods of obstructed discharge is the principal object of the Ijsel lake.

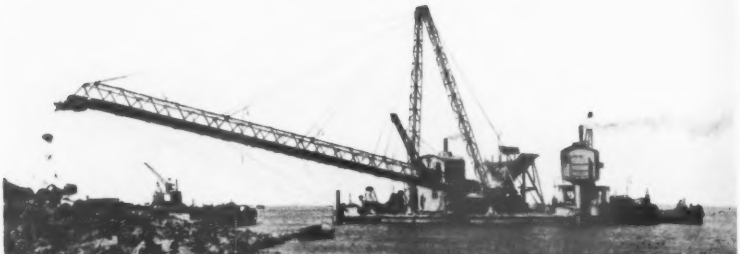
The shape of the parts to be embanked has been determined with the purpose (*a*) of leaving out the deepest parts of the basin, as they would be very difficult to drain; (*b*) of embanking as much clay and as little sand as possible. Large sandy areas near Enkhuizen and Harderwijk and the isle of Urk are kept outside the polders. In the reclaimed parts 71 per cent. of the soil will consist of heavy rich clay, 19 per cent. of light clay, 2 per cent. of peat, and 8 per cent. of sand.

Phot. Koninklijke Luchtvaart Maatschappij (Royal Dutch Airlines)

Phot. K. L. M.

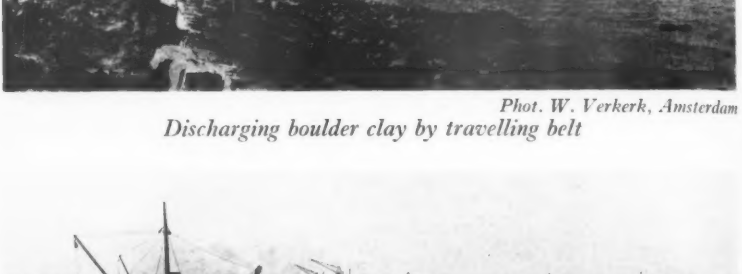
Enclosing dam—Wieringen to Friesland

1. *Beginning of central island (Breezand), 10 April 1929*
2. *Breezand looking west, 11 May 1929*
3. *Breezand complete, 1 May 1930*



Phot. W. Verkerk, Amsterdam

Discharging boulder clay by travelling belt



Discharging sand by suction dredges

Phot. K. Maaskant, Wieringen

Brushwood mattress to protect pile dam

Between the new polders and the existing coast a chain of small lakes (Gouw lake, Ij lake, Eem lake, etc.; together 95,000 acres), linked together by channels, will be kept to act as catch-water basins and as canals for inland navigation between the harbours along the Zuider Zee coast and the existing canals.

Besides the principal object of land reclamation, the above-described general design offers many other advantages—and also some drawbacks.

Advantages: (*a*) The enclosing dam has a total length of 20 miles, of which 1½ miles are west of Wieringen and 18½ miles east of the island. Around the enclosed part of the Zuider Zee the total length of the sea banks amounts to more than 200 miles, to be replaced by the ten times shorter and much stronger enclosing dam. This involves less maintenance (calculated at more than £12,000 a year) and far more security.

(*b*) The constant level of the Ijsel lake, in contrast to the very variable level of the Zuider Zee owing to the wind, will involve an improvement in the drainage of the districts around the enclosed area.

(*c*) A new road and railway having been projected along the enclosing dam, a much shorter connection will be created between the province of North Holland (and especially Amsterdam) and the northern provinces.

The advantages (*a*) to (*c*) have been estimated to represent a capitalized value of at least £1,500,000.

(*d*) The establishment of the Ijsel lake as a freshwater lake is of great importance to the provinces of North Holland and Friesland, where in the dry period from April to August fresh water is badly wanted for agricultural and industrial purposes, for drinking water for the cattle, and for inland navigation on the canals of Friesland. The damage caused in the two provinces by the deficiency of fresh water has been evaluated at about £400,000 per annum or capitalized at about £8,000,000.

Disadvantages: (*a*) The construction of the enclosing dam will cause (as has been calculated) the height of the storm tides in the Wadden Zee north of the dam to rise to a higher level than hitherto (see Fig. 2). The rise will be greatest at Den Oever (45 inches) and decrease gradually north-eastward and north-westward to zero. This involves the raising of the height of all the existing banks along the coasts of the Wadden Zee. The work is in course of execution, as it must be finished before the final closing.

(*b*) The Zuider Zee fisheries, occupying about 2000 butters, is doomed. On the other hand however, on the Ijsel lake and the other lakes above mentioned, with a total area of 365,000 acres, thriving freshwater fisheries may be developed in due time. The Government have taken measures to make the transition as easy as possible, and to grant indemnification as far as necessary.

III. The Execution of the Works

The enclosing and the works connected therewith include: (1) The enclosing dam between Van Ewijksluis and Wieringen (finished in 1925). (2) The enclosing dam between Wieringen and Zurig (final closing probably in 1932, finishing in 1933). (3) The sluices and locks near Den Oever and Kornwerderzand (will be finished in 1931). (4) Raising the banks around the Wadden Zee (will be finished in 1932).

The dam must be strong enough to preclude practically any rupture during

storm-tides. It is laid in the open sea with an average depth of 10 feet, increasing to 25 and even 40 feet in the channels to be crossed. The dam consists of a core of boulder clay, backed by sand covered by a layer of clay. To protect the outer slope from wave action it is faced with stone (basalt from the Rhine and limestone from the Maas) laid on rubble, and extending to well above the storm-tide level. The inner slope is protected likewise against the scour of the waves on the Ijsel lake. The toes below the water-line are protected with mattresses of brushwood weighted with rip-rap. The crest of the boulder-clay core reaches to the level of the highest storm-tide.

The height of the dam is sufficient to prevent the storm waves from overtopping the crest. On the inner side a high berm 112 feet wide is provided, on which a double-track railway and a 20-foot road for ordinary traffic will be constructed. The level of the berm has been fixed so that the road may remain free from the wash of the waves on the Ijsel lake during storms.

The discharge sluices are divided into two groups: near Den Oever three sets of five sluices each will be built, and near Kornwerderzand two such sets.

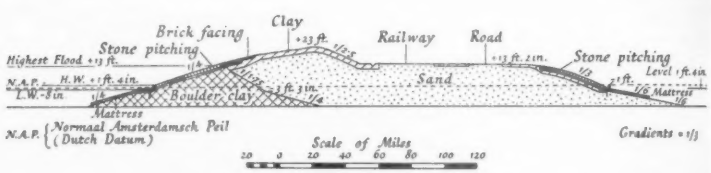


Fig. 3. Cross section of enclosing dam from Wieringen to Friesland.

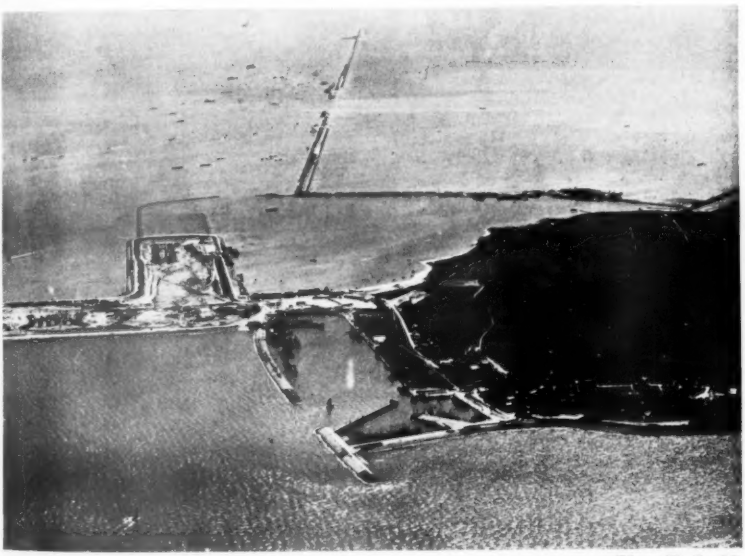
Each sluice has a width of 40 feet; the depth on the sills is 12 feet at low water. The sluices are shut by two lifting steel sluice gates and a pair of hinged greenheart gates closing automatically when the tide rises. The ship locks built in connection with the sluices are 46 feet wide and 470 feet long.

Both groups of sluices have been built in the open sea. For that purpose the necessary space was enclosed by temporary dams of boulder clay and sand, protected by stone facing and mattresses of brushwood, and then drained to make the excavations for the foundations. The superstructure of the sluices was then executed in the pits *saevis tranquillus in undis*.

Not so the enclosing dam, the whole length of which has to be constructed in the open sea. First the boulder-clay core is built. The boulder clay is a firm, tough and heavy loam of glacial origin; in a fresh plastic state it resists wave action and the scour of flowing water very satisfactorily. It is found in the bottom of the sea around Wieringen and between Wieringen and Friesland, and is consequently being dredged in the vicinity of the works, loaded into hopper barges and, when these have been towed into place, it is dumped by opening valves in the bottom of the barges. The depth of the water between the channels varies from 8 feet to 15 feet; when the depth has decreased to 6 feet below water, dumping becomes impracticable and the boulder clay is then discharged from plain barges by floating cranes with grab buckets and long jibs (up to 80 feet).

Phot. K. L. M.

Phot. K. L. M.



Phot. K. L. M.

Bank—Den Oever to Medemblik

1. *Beginning from Medemblik, April 1928*
2. *Oude Zeug, middle of bank, 4 May 1928*
3. *Bank at Den Oever and locks and sluices in dam*

Phot. K. L. M.

Last gap in Den Oever–Medemblik bank, 13 July 1929

Phot. W. Verkerk

Tide running out at low water, about 23 July 1929

Phot. W. Verkerk

Nearly closed, 27 July 1929

Meanwhile the sand is dumped behind the boulder clay by hopper barges. The sand is also dredged from the sea bottom. After dumping has become impossible the sand is deposited by suction dredgers discharging it from barges through pipes. During the construction care is taken that the boulder-clay core remains well in advance of the sand fill behind it, to prevent the two materials from being mixed, and to avoid scouring away of the sand by the concentrated tide currents round the head of the work. The clay used for protecting the sand body is also dredged from the sea bottom; it is discharged upon the dam by floating belt conveyors. Finally the surface is finished by hand. The stone facing is placed after the slopes below the water-line have been covered by the mattresses.

When in consequence of the growth of the enclosing dam the gaps between the different sections in course of construction are narrowing, the tidal movement inside (south) of the dam will gradually be subdued and finally disappear. Consequently, the narrower the gaps, the stronger the tidal flow will become; and logically it should be feared that the scouring power of the current might

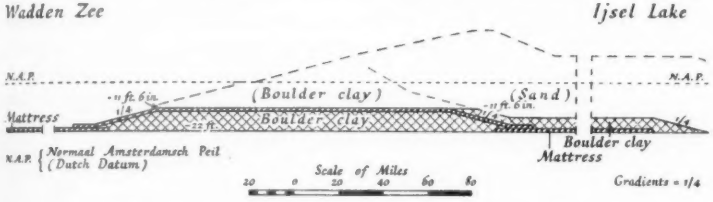


Fig. 4. Cross section of sill dams in channels.

grow to such an extent that the already finished sections of the dam would be endangered and the final closing become impracticable.

A careful investigation of this problem, combined with hydraulic laboratory experiments, has shown that under normal circumstances the velocities will not increase enough to be able to overcome the resisting power of boulder clay or mattresses of brushwood weighted with rip-rap. Only if in the last year some months before the final closing, when the total width of the gaps has been reduced to some hundreds of yards, a high storm-tide should occur, there would be a great risk of rather extensive damage. But, according to long experience, high storm-tides do not occur between the beginning of April and the middle of August. Consequently, if we can manage to arrange the final closing before August 15, no such risk is run.

The final closing is to be effected in the deep channels called Vlieter and Middelgronden (respectively near the isle of Wieringen and the coast of Friesland), the reason being that (*a*) the work in the deeper channels is more accessible under all circumstances of wind and tide for the larger dredging plant than in the shallower sections; (*b*) before and during the final closure the risk of scour of the sea bottom on both sides of the still submerged parts of the dam is less.

On the other hand, in the deep channels larger quantities of materials have to be dumped to build up the body of the dam; this may be inconvenient when

at the last moment the work must be finished as fast as possible. To avoid this trouble sill dams have been built across the channels. They constitute a foundation of the boulder-clay core and are built up of the same material. Accordingly the crest is 130 feet wide at a depth of 11 feet 6 inches below N.A.P. and wholly covered with mattresses heavily weighted with rip-rap to protect it from scour.

The closing of the final gaps (total length 2·7 miles) in the last year will be effected much in the same way as the construction of the other parts of the dam, viz. by dumping the boulder-clay core dam through the gaps, and making the back filling of sand follow up behind. The execution however must be forced as much as possible, and consequently a large dredging plant of powerful units will have to be concentrated in a short space.

A total length of 10·8 miles has been finished at present, besides the sill dams. In 1927 and 1928 a length of $3\frac{1}{4}$ miles had been constructed near the coast of Friesland together with the temporary dam for the sluice pit at Kornwerderzand (the dam around the sluice pit near Den Oever had been built already in 1922).

In 1929 the large middle part of the enclosing dam was started on the shallows of Breezand by dumping an artificial island in the open sea with two harbours of refuge for the dredging plant during storms. From this island the dam was extended to east and west, and in the following year attained a length of 5 miles. Meanwhile a length of $2\frac{1}{2}$ miles has been constructed from Den Oever eastward, making a total for 1929 and 1930 of $7\frac{1}{4}$ miles, and leaving 5 miles for 1931 and the gaps for final closing for 1932.

IV. The Reclamation of the Wieringermeer polder

This may be taken as typical of all the reclamation works in the Zuider Zee, although gathered experience may cause some alterations in details. The area of this polder is 48,000 acres, *i.e.* nearly 9 per cent. of the whole reclamation scheme.

The construction of the embankments between Medemblik and Den Oever

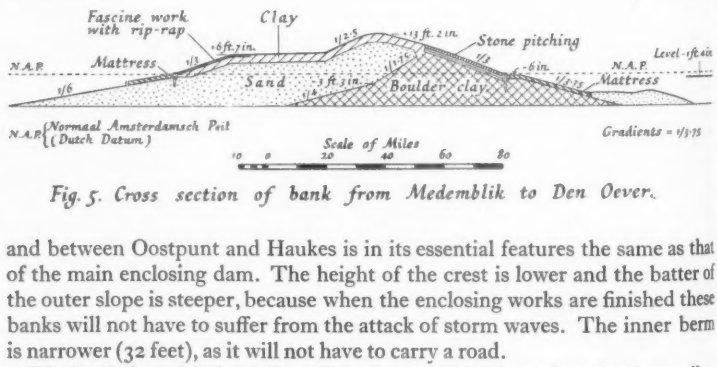


Fig. 5. Cross section of bank from Medemblik to Den Oever.

and between Oostpunt and Haukes is in its essential features the same as that of the main enclosing dam. The height of the crest is lower and the batter of the outer slope is steeper, because when the enclosing works are finished these banks will not have to suffer from the attack of storm waves. The inner berm is narrower (32 feet), as it will not have to carry a road.

The bank from Medemblik to Den Oever, which has a length of 11 miles,

was started in three places simultaneously: at both ends and in the middle on the shallows of Oude Zeug; in the latter place in two directions. In little more than two years the contractors succeeded in finishing the work.

The general drainage scheme of the polder establishing the trend of the canals, main roads, and drains, the parcelling out of the land, and the emplacement of the pumping stations, was drawn up in 1927. According to the plan the polder is subdivided into four sections on account of the divergence of level in the different parts of the Wieringermeer; each section has a fixed water-level, 4 feet 8 inches below the surface of the lowest land in that section. The difference of the water-level between the sections is 2 feet 4 inches.

The scheme is based upon a careful investigation of the modern requirements of agriculture in the Netherlands. Great stress has been laid on the claims of easy and cheap transport by land and by water, and on the care for adequate connections with the existing roads and canals in the adjacent country. The parcels have an area of 50 acres with a length of 880 yards and a width of 275 yards; the short sides of every parcel are bounded at one end by a metalled road and at the other end by a collecting drain accessible to small barges. In one section, by way of experiment, a number of parcels have received other dimensions. The parcels are separated by feeder drains, collecting the water from the land and transporting it to the collecting drains. From these it flows through the main drains to the pumping stations.

The drainage of the polder has been divided between two pumping stations, in order to have more safety in case of mechanical or other trouble. The Lely (near Medemblik) is an electrically driven station with three centrifugal pumps having a total capacity of nearly 260,000 gallons per minute. The Leemans (near Den Oever) has two centrifugal pumps driven by Diesel motors with a total capacity of more than 120,000 gallons per minute. Both stations had to be built within temporarily enclosed pits in the open sea, as has been mentioned for the sluices in the enclosing dam.

The capacity has been determined by the necessity for preventing the water-level in the drains from rising more than 8 inches above the fixed normal level even in periods of abundant rainfall. As it is supposed that in consequence of the draining of the land, the surface will subside gradually more than 2 feet, the normal level in the different sections is provisionally fixed at 2 feet 4 inches higher than it is expected to be in later years.

Along the western coast of the Wieringermeer a number of districts formerly discharged their surplus water into the sea. At present the water is received in a discharge canal running along the coast from Aartswoud over Van Ewijksluis to Oostoever, where it is evacuated through sluices into the harbour of Nieuwediep. The water must be stored temporarily in case the evacuation is obstructed by high storm-tides for some days. To this purpose, south of the enclosing dam between Van Ewijksluis and Wieringen, a storage lake of 1650 acres, the Amstel lake, has been left. The discharge canal, at the same time destined for inland navigation, is connected with the polder canals by two reinforced concrete locks near Haukes and Kolhorn, built again in temporarily enclosed pits in the open sea.

The main drainage canals and the collecting drains have been dredged before the water of the enclosed Wieringermeer was pumped off, to economize time

Fig. 6. The drainage scheme for the Wieringermeer polder

and money, and to facilitate the flow of the water to the pumping stations during the period of pumping off the enclosed water.

As soon as the sea bottom was dry (August 1930) the digging of the feeding drains and the field ditches for superficial drainage was started. In the future the ditches will be replaced by pipe drains, but at present the soil is not yet consistent enough. This work is done by hand or mechanically. A number of engines of very different types have been put into service.

In 1927 a small experimental polder of 100 acres was embanked near Andijk (east of Medemblik) to investigate the best methods of cultivation of the new soil, especially in view of its content of salt. In 1928 it was cultivated for the first time with favourable results. It was found that only rain and snow could rid the soil of its salt by leaching it out, and that intensive drainage as deep as possible was necessary to that effect. The drainage works must be executed very rapidly, to have the whole area in cultivation as soon as possible. At first probably most of the heavy soil will be laid in grass.

V. Costs

In 1914, before the war, a provisional estimate of the costs of the Zuider Zee works was made. The enclosure was estimated at £5,500,000; the reclamation of the four polders was estimated at £13,000,000, of which 10 per cent. was for the Wieringermeer polder, and would involve the gain of 480,000 acres of fertile soil. At present this pre-war estimate, on which the Bill of March 1918 was based, has only a historical value.

In 1924, when the works had been going on for some years, a new estimate was made. The enclosure was then estimated at £7,500,000 and the reclamation (inclusive of compound interest at 5 per cent.) at £38,000,000, of which £3,100,000 were for the Wieringermeer polder. This estimate calculated a surplus of about £4,200,000, the value of the reclaimed land being put at nearly £80 per acre.

During the execution of the larger works since 1925 it was soon found that the estimate had been too low. At present the situation can be viewed more completely. The enclosure of the Zuider Zee will probably cost about £11,000,000, and the reclamation of the Wieringermeer polder £5,000,000. It is expected that instead of a surplus the works will leave a deficit of roughly £16,000,000. Covered by a 4½ per cent. fifty years' loan, this would require an annuity of £850,000. This is not considered too much against a gain of 550,000 acres of fertile land.

Moreover, excepting the stone and part of the wood, steel and cement, all the materials used are home-made; by far the greater part of the outlay remains in the country, and to a large extent is converted into wages, thus combating unemployment as well as over-population in the best way.

DISCUSSION

Before the paper the PRESIDENT (Admiral Sir WILLIAM GOODENOUGH), after referring to the death of the Princess Royal, of Marshal Joffre, and of Admiral Royds, said: The solution of geographical problems and the benefit of mankind are very closely connected. That many-sided man, Goethe, inspired no doubt by his great admiration for Humboldt, spoke of three things which he hoped for and indeed foresaw. They were not matters of poetry or literature, they were three

things of great geographical importance not pertinent to the subject under discussion. He might well have mentioned a fourth: the reclamation of the Zuider Zee, that struggle by man against the incursions of Nature to obtain subsistence for an ever-growing population. No man is more entitled to speak with authority on such a subject than Professor Thierry. After spending ten years in the northern part of Holland he spent another ten years on the works of the Zuider Zee itself, and he is now well occupied as Professor of Hydraulic Engineering at Delft. I can introduce Professor Thierry to you as one who has taken a part and is now taking a part in a work of great beneficence.

Professor Thierry then read the paper printed above, and a discussion followed.

Colonel Sir CHARLES CLOSE: I have listened, as we all have, to this lecture with much interest, partly because the lecturer referred to over-population. Now if there is an over-populated country in this world it is Great Britain. Professor Thierry said what is perfectly true: that if you have an over-populated country you must find some means of employing the population. Now what is the Ministry of Agriculture doing about reclaiming the Wash? Why do not they do it? If they did enclose the Wash and if they reclaimed so many thousand acres, what use would be made of it?

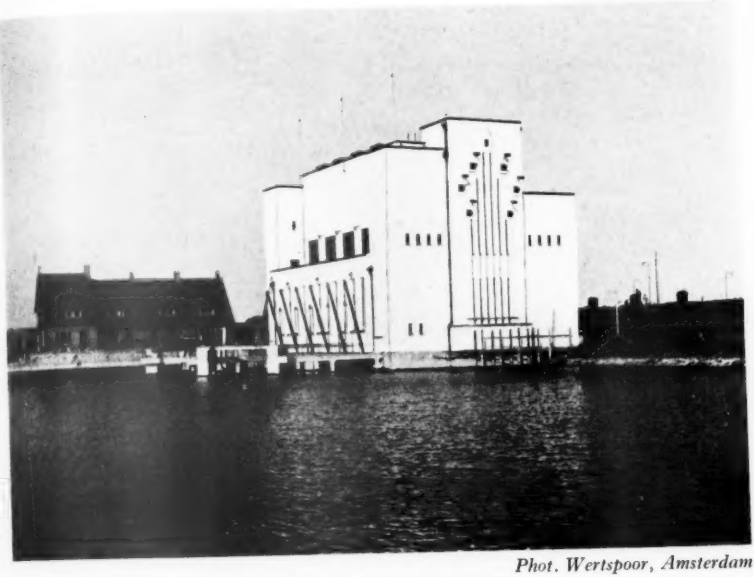
The lecturer has given us a clear account of the operations that have been going on in a great fight between man and Nature, and his accuracy is only to be expected from a countryman of Snellius. Everybody here knows that Snellius was one of the founders of geography, and we can always look to Holland for accurate work. In the case of our lecturer we have had an excellent account of a wonderfully designed and accurate experiment against the forces of Nature.

There is one more word I should like to add, and that is: I asked the lecturer how to pronounce the place-name Zuider Zee, and I gather from him that it is practically impossible for an Englishman to pronounce it.

Sir THOMAS MIDDLETON (Vice-Chairman, Development Commission): Sir Charles Close has asked me why it is that we have not reclaimed the Wash. The answer is a very simple one. Three hundred years ago a fellow-countryman of the lecturer's came over and reclaimed nearly all the Wash that was reclaimable: there was little, apart from drainage, left for us to do. After the war we did attempt to enclose some small fragments of this area that had been left by the lecturer's distinguished compatriot, but the strips of land that were found suitable for reclamation were so narrow that the work was, from a financial point of view, unprofitable. We have not available in this country such large areas ripe for reclamation as those which have been described to us this evening.

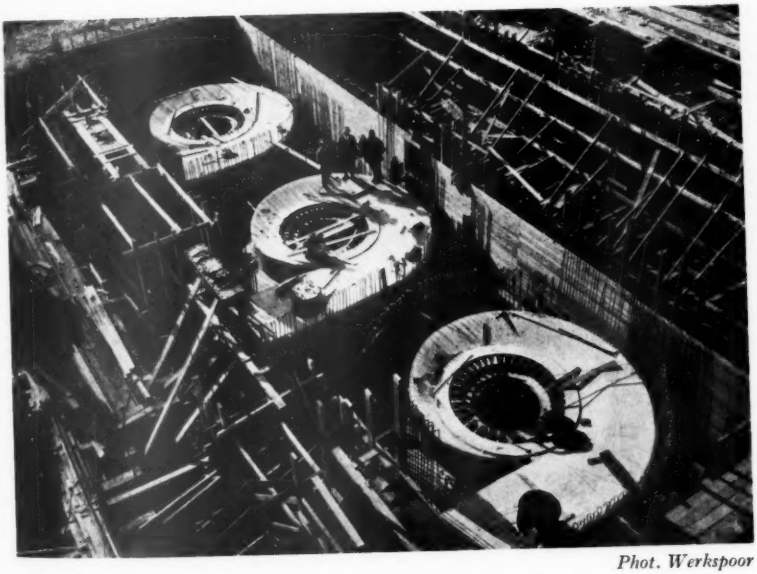
Having answered Sir Charles Close's question, I should like, for myself, to thank the lecturer for the extremely interesting and informative account he has given us of the work now progressing in Holland. We have been watching it from a distance with interest; I may say with wonder. It is a marvellous experiment in reclamation, on the greatest scale known to me. I have not heard of such a gigantic effort in any other part of the world, and it seems to me to be quite a remarkable piece of evidence of the courage of the Dutch nation. It must indeed have meant great courage to face such embanking and engineering works as have been described.

But I think the reclamation described is attributable to something more than courage. Courage was undoubtedly necessary for the enterprise, but the Dutch have long been accustomed to victories over the sea. They have learned how to get the better of it in the smaller embankments which have been undertaken in the past. This particular venture could not have been embarked upon were it not that the Dutch nation now possess most competent engineering skill and also



Phot. Wertspoor, Amsterdam

Pumping station, Medemblik

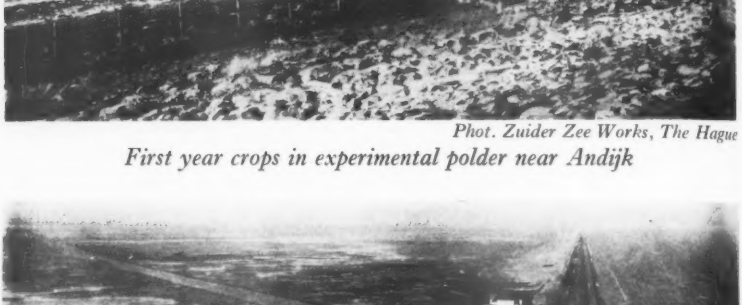


Phot. Werkspoor

Centrifugal pumps under construction

Phot. Zuider Zee Works, The Hague

First year crops in experimental polder near Andijk



Phot. Werkspoor

Wieringermeer polder pumped dry, August 1930

Phot. Wieringermeer Board, Alkmaar

Cultivation of the land, Wieringermeer polder, winter of 1930

most competent skill in directing agricultural affairs. The rapidity with which, first of all, the bank was constructed, drained in methodical fashion, immediately converted into tillage land and crops grown on it, is proof that the plans had been carefully laid; and with what exactitude those plans are being carried out to a successful conclusion has been illustrated to us on the screen to-night.

I am sure that every one who has listened to the lecture will feel with me that we have had a most interesting and fascinating account of the reclamation work now going on in Holland.

Sir GEORGE HUMPHREYS (President, Institute of Civil Engineers): I should like to say, first, speaking as an engineer, what a very great pleasure it has been to me to hear this very succinct and lucid account of the works on the Zuider Zee. They have been described truly as a battle with Nature. If you look at the coast of Holland and see the islands that lie strung out in disconnected line along the sea front you will recognize at once what power there is in the sea to have created them. Anybody who knows the place and has seen it on a dreary winter's day will have very great respect for what old Father Neptune can do.

Now the point that impressed me most in the lecture is the little remark that the lecturer let fall: that all the materials were home-made. You will observe that these huge embankments which are creeping out into the sea are composed, after all, of some very simple and common materials. There is sand, clay, and brushwood, which I suppose is home-made. I think the only imported material is the stone rip-rap that was put over the whole. It is in the use of these materials and the placing of them in the proper position that the genius of the Dutch engineers is seen. The whole key to the situation in making these dykes was to put the boulder clay down first, to keep the sand behind, and then to follow that up in regular progression by putting on the brushwood and afterwards the stone pitching. It is the finding out of that sequence of procedure and the putting it into execution that really has stamped the Dutch engineers as geniuses in that particular form of construction.

I did not come prepared to speak on the subject; it really is a little out of my province. But, speaking as an engineer, may I offer to the lecturer my sincere congratulations upon what he has told us?

The PRESIDENT: Professor Thierry, I hope that you will believe that the close attention with which you have been listened to and the considered remarks which have been made subsequent to your lecture indicate how deeply interested we have been. I am not an engineer. Of the two things which have been mentioned, one by Sir Thomas Middleton, one by Sir George Humphreys, I do not know which fills me most with admiration: the courage which is required to undertake such a project, or the skill which is required to execute it. You finished rather abruptly. We would have very gladly heard something of the more human side. One knows well that such a great project as this is not undertaken without great anxiety and disappointment, and these anxieties and disappointments are the things which produce a display of that courage that has been spoken of.

Not only this Society but all intelligent people in this country will watch the conclusion of this project with very great interest. They would have done so in any case, but they will do so all the more from the fact that you, Professor Thierry, have come here to tell us in a most interesting and sympathetic way of the details of the task. I can assure you that if in two or three years' time when it is completed you can come and show us more pictures, tell us more of the details of the completed work, you will be received with open arms and welcomed most sincerely and cordially. On behalf of the Society I offer you our most sincere thanks.

THE LATE PROFESSOR SCHWARZ'S CONTRIBUTION TO THE GEOLOGY OF THE COAST OF MAURITANIA.

Edited by Professor J. W. Gregory, F.R.S., from a transcript of the original note-book made by Mrs. Schwarz

THE coast lands of Mauritania between St. Louis and Cape Blanco promise light on several problems of special geological interest. If the Cape Verde Islands and Canary Islands had, as part of the traditional Atlantis, been connected to Africa by land during the time of man, some trace of that connection would be expected in the structure of the Mauritanian coast; and determination of the age of the various formations along that coast is essential to solution of the problem. If the raised beaches and submerged land surfaces which are so conspicuous along the coasts of Scotland and the Mediterranean are due to a world-wide rise and fall of the sea, these beaches and submerged surfaces should also have been formed along the Mauritanian coast and some trace of them might still be preserved. Again, in former times a gulf from the Atlantic ran eastward into the Sahara in this region; and this gulf may have been the outlet from the Upper Niger Basin.

The geology of this coast has been previously studied by many French geologists and geographers, notably by MM. Chautard, Chudeau, Guilbert, A. Dereims, G. F. Dollfus, and P. Lemoine. A summary of the observations up to 1914 has been given by Professor Lemoine,* and on the raised beaches by Depéret.† Since then most work has been done by M. H. Hubert,‡ who has referred to the vast areas of detrital material, which covers 200,000 square kilometres in Senegal, the Gambia, and Portuguese Guinea, and to the geological features of this drift. A map of the coast by V. Vandel, published in *La Géographie* (xx, 1909, No. 1, Pl. 1), marks most of the place-names mentioned by Professor Schwarz.§ (See also Fig. 1 in this paper.)

The observations of the French geologists have shown that the coast of Mauritania consists of recent deposits containing sea shells and is fringed by raised beaches up to the height of 100 feet above sea-level, and in the interior up to 180 feet.

1. *Field Observations*

As the geological history of the coast depends largely on negative evidence all the facts observed are of service, and it is useful to record the geological observations noted by Professor Schwarz in the journal of the expedition which ended tragically with his death at St. Louis on 19 December 1928. He started from St. Louis (16° N.) northward along the coast, and 7 miles north of the Moorish village of N'Sar Tout,‖ on the outskirts of St. Louis, noted a

*In *Handbuch der Regionalen Geologie*, vol. vii, pt. 6, 1913.

†C. Depéret, *C. R. Congr. Géol. Internat.*, xiii, 1926, pp. 1411–2.

‡H. Hubert, "Sur La Géologie du Sénégal et des Regions Voisines," *Bull. Géol. Soc. Fr.*, (4) vol. xvii, pp. 104–105, 1918; and other papers.

§A sketch-map is also given by A. Dereims, *Mém. Soc. géol. France, Pal.*, vol. xviii, Mém. 3, p. 8.

‖The spellings of the place-names in these notes and in Fig. 1 are mainly those adopted on Vandel's map, as the most useful in connection with Professor Schwarz's observations. The latitudes of most of the localities are given here as a guide to the relative positions.

bed of clay full of roots and evidently the remains of a *marigot* or spillway from the Senegal River. The journal of the next day notes that the Bay of Sebacha marked on the map does not exist, and suggests that its disappearance may be due to some recent red sand dunes.

After passing Et Bordat, south-west of Boguent (16° 55′ N.) marine shells were found on the coastal plain and dunes of red sand were seen inland at right angles to the shore. He continued along the "Aftout," a flat plain between the coastal dunes and the red Saharan dunes, and described some of the coastal dunes as wooded and with the front as steep as a wall. He passed several sebkas or depressions containing lagoons, and crossed the Marigot des Maringouins—a spillway in line with the Senegal River and from the angle where it turns south at a right angle and begins a course of 30 miles behind the coast before it enters the sea at St. Louis (see Fig. 3). Two days later at Tefourtès (17° 36′ N.), just north of a long red sand ridge, a note on the map marks "*Cerithium* begins." Five miles farther north at Tivourvourt (17° 41′ N.) good water occurs in yellow sand, in pits 6 feet deep.

At Nouakchott (18° 8′ N.) the old fort stands on a big red dune and nearby grey sandy mud contains the shells of *Arca senilis*.

North of Marsa (18° 19′ N.) the red sand dunes of Saharan sand are covered with *Arca*, *Pyrula*, etc.

At Ejreïda, just north of Marsa, is a bed of salt 2½ inches thick; the salt is very coarsely crystalline, without well-formed cubes, and mud occurs between the grains which are covered by a brown crust with small crystal aggregates of a white salt.

From Marsa to Bilaouak (18° 34′ N.) the red sandhills are thinly covered with shells, including *Arca*, *Tellina*, large *Strombus*, *Fusus*, *Cerithium*, etc. At Gendert, north of Marsa, a bed nearly an inch thick of ilmenite with garnet, olivine, etc., outcrops on the shore.

In places the red sand has been blown away and exposed the impermeable floor of marine clay with shells, above which at Sbar, inland from Toueïl, stand two large yellow sand dunes.

Just south of Bilaouak (18° 34′ N.) are low yellow coastal dunes, and north of the same village the red sandy plain is covered with *Arca*, some with the two valves joined, and *Cardium*, *Turritella*, *Dosinia*, *Conus*, and *Bulla*.

The Mottes d'Angel at Lemsid (at 18° 42′ N.) was formerly a promontory which has been worn away by the sea. Banks of the material that formed it still occur under the sea. He found there some fragments of vesicular basalt, and concludes therefrom that the promontory had a volcanic base. The dunes are covered by black sand. Pits in a conglomerate of *Arca senilis* yield good water.

North of Lemsid the plain is strewn with shells of *Arca*, *Fusus*, *Murex*, *Conus*, etc., with their natural colouring.

At Aleïbataf (18° 49′ N.) are many wells about 5 feet deep in red sand, containing about four layers of shells. The sand lies on clay with shells. No dunes occur there. The red sandy plain to the north is covered with shell fragments and glistening cleavage flakes of aragonite. In the red clay at the bottom of a sebka are gypsum crystals up to an inch long.

At Chedala (18° 58′ N.), which Professor Schwarz identified as Hanno's

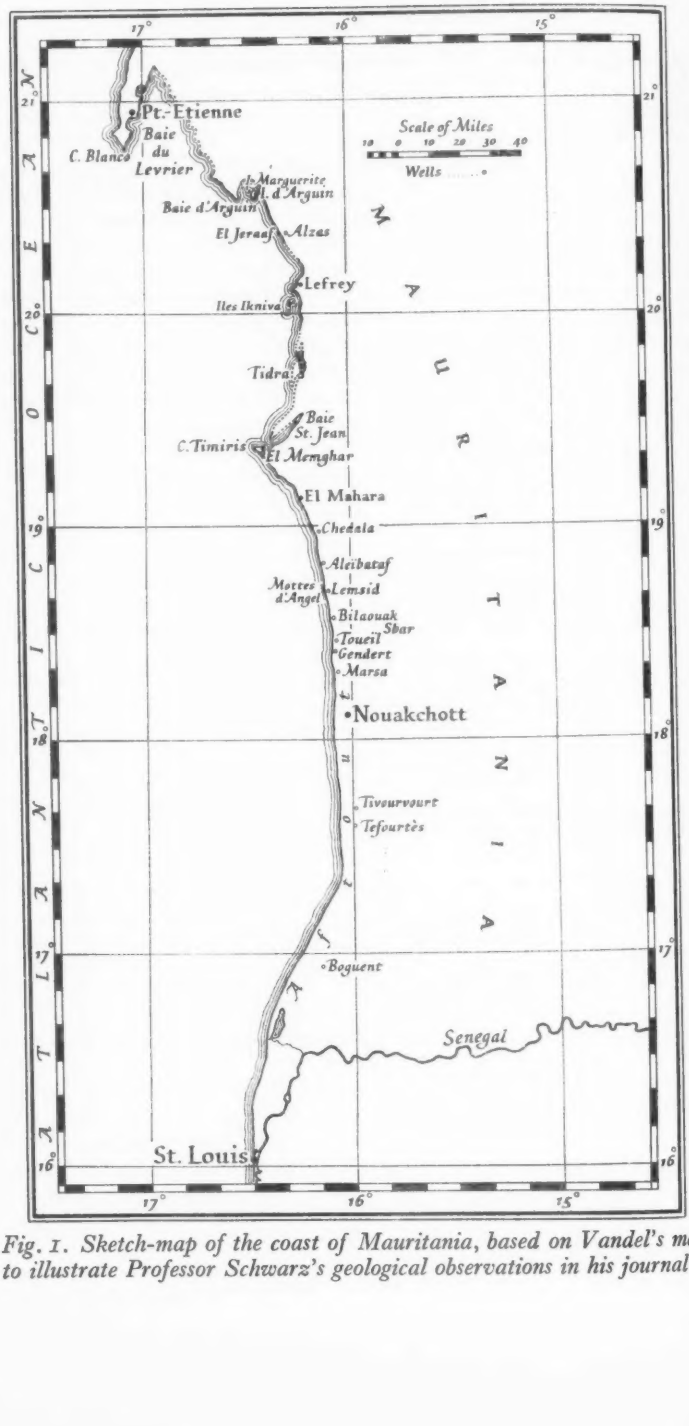


Fig. 1. Sketch-map of the coast of Mauritania, based on Vandel's map, to illustrate Professor Schwarz's geological observations in his journal

Melissa, are many graves enclosed in blocks of a shell conglomerate, which is found in blocks thrown up on the beach. At one grave he noticed a piece of gneiss. "A clinker of volcanic cinder with black shale" is recorded as an indication of Carboniferous strata.

Just north of Chedala is a bank of oyster shells covered by coarse sand and a dune which is pushing into the sea. Along this coast from 19° 3′ to 19° 13′ is a flat plateau, of reddish yellow sand, which has been cut up into a series of blunt-ended blocks. They are called El Mahara, and from a short distance look like mountains, although they are only from 25 to 45 feet high. They are covered by shells of *Arca*. Ilmenite sand was noted again here, and elsewhere along this part of the journey.

On the plain north of the El Mahara hills a piece of gneiss was collected from the *rak*, a cemented breccia. Nearby "the sand is full of black scales, which appear to be the teeth of annelids."

Cape Timiris (19° 22′ N.), at the end of the march along the shore, is a plain of red sand, 5 feet above sea-level, strewn with the shells of *Arca*, *Turritella*, *Bulla*, *Conus*, and large volutes. Some of the mounds of *Arca*, of which one mass is 20 feet high, have the sides as straight as if thrown up as a rampart.

From the Bay of St. Jean to the Bay of Arguin, a little south of the Spanish frontier at Cape Blanco, Professor Schwarz continued his journey by boat, to examine the islands and channels off the shore. The land in this area is a continuation of the same sheet of shelly red sand, but to the north it is largely cemented into sand-rock and ferruginous sandstone.

Tidra, some 20 miles north of Baie St. Jean, consists of white and red sand and cemented sandrock, with some pebbles of red quartz and quartzite; and there were found the bones of a large turtle and a nodule of black limestone containing *Arca*, *Cardium*, *Conus*, *Turritella*, and a volute.

Fifteen miles farther north, and south of the promontory of Lefrey, is a group of small islands marked on Vandel's map as Isles Ikniva. This name is said to be a mistake, and Professor Schwarz calls them the Kirouan Islands. They are remnants of the sheet of sandrock, which extends north to Arguin. Great Kirouan is a mass of hard white or creamy sandrock, with many large fallen blocks of this material on the beach. A little over 20 miles north, the triple headlands of El Jeraaf, beyond Alzas (20° 22′ N.), consist of ferruginous sandstone.

The sandrock occurs also on Arguin Island, where amongst other exposures it forms a natural arch over a cistern for water. The island of Arguin (20° 34′ N.) is a detached portion of the ferruginous sandstone plateau of which El Jeraaf, the Kirouan Islands, and Lefrey promontory are all parts. The shells occur in pockets as they do all the way from St. Louis, showing that the creamy sandrock is only a more agitated and decolorized portion of the red sand. The surface of the island is rough, as owing to the resistance of the iron-cemented lumps to weathering they stand above the general level.

Arguin Island, according to a map of 1722, was 3400 metres long; it is now 5500 metres, and has therefore grown 2100 metres. The sand grains are fairly coarse, and are all of quartz, varying in colour from milky white, yellow, rose, and smoky to black. No agate, garnet, or any other accessory minerals

were seen in it, and their presence is not to be expected, as all the sand is blown from the Sahara. A little ilmenite occurs in the sand, but it may not be native to Arguin Island, as there are blocks of a vesicular hornblende-andesite with large hornblende crystals, and blocks of gabbro and diorite, which have been brought as ship's ballast, probably from Sweden. A quartzite lintel and slab of basalt that has been used as a millstone are also foreign to the island. A Neolithic diorite implement with a chisel edge has been found at the settlement, and also some chips of flint, which may be from the sandstone, though none was found *in situ*. The flint may be from the same source as that used in the Neolithic flint implement factory in the Spanish territory of Rio de Oro.

North-west of the Island of Arguin is the smaller Isle Ardente. It consists of a plateau of the sandrock with some layers containing ilmenite, some shells of *Arca*, *Cardium*, and *Mya*, and quantities of broken pottery and mounds of *Arca*.

On the mainland opposite Arguin are sand dunes of creamy sand, resting on red Saharan sand and barchans with the rounded faces toward the north-east.

At Alzas, on the mainland, the sand was carefully sifted in $\frac{1}{4}$ and $\frac{1}{8}$-inch sieves, but the only material seen was quartz, clear or milky or smoky or rose coloured, with some greenish mineral like epidote.

Around Alzas are areas known as *Rag* or *Arek*. They consist of sand with quartz pebbles, about the size of a walnut, and the matrix is cemented by salt. The colours of the quartz include black, brown, yellow, rose, mottled, white, and red. He found no other constituent.

2. *Conclusions as to the Geological History of the Coast*

During Professor Schwarz's stay at Iznaia in the Bay of St. Jean east of Cape Timiris, he visited the "valley of Agatroun," which runs parallel to the bay. He wrote in his Journal that it is not really a valley, but a plain with a succession of red sandhills with *Murex*, *Triton*, and *Arca*. The shells occur up to the top of the hills. The same sand plateau occurs on the north-west side of the bay and no rock was seen on either side of the bay. Fragments of pottery occur in the red sandhills. The Journal remarks, "I cannot explain the red sand with interbedded marine shells, unless it was deposited in an inland sea, like the eastern end of the Mediterranean, of which the Canary Islands are the remnants of the western margin. If it had been deposited in the open ocean, the waves would have rolled about the sand grains and decolorized them."

The country around the Baie of St. Jean gave Professor Schwarz his clue to the structure and history of the Mauritanian coastlands. He objects to Chudeau's determination of the hills as "dunes covered with marine shells," for that view of their structure he regards as incomprehensible. The Baie of St. Jean is a long narrow inlet running inland north-east for about 15 miles. The peninsula on the north-western side, as seen from El Memghar, is an isolated former continuation of the sandhills which are from 100–120 feet high on the south-eastern shore. He regards the hills on both sides of the bay as part of a once continuous plateau of sand, with layers and pockets of shells; the plateau has now been dissected into isolated hills, with the shells left strewn over the surface.

The same structure is shown for the Arguin area, by two sketches of ground, in which the hills all rise to the same level. That these hills were all parts of a continuous sheet which has been broken up by the excavation of the valleys is proved by the presence of a layer of shells* which must formerly have been continuous, and also by the pockets of Arca shells. The hills therefore

Fig. 2. Professor Schwarz's Mauritanian Basin

are masses left by the sculpture of the country and were not piled up above the valley floors as dunes.

At Arguin the islands and hills are the parts that were more firmly cemented and have resisted denudation, while the softer sandrock and sand have been washed away.

*The shells from the raised beaches of Senegal and Mauritania have been described by G. F. Dollfus, "Les Coquilles du Quaternaire marin du Sénégal: Introduction géologique par A. Dereims," *Mém. Soc. géol. France, Pal.*, vol. xviii, 1911, 72 pp., pl. 14–18.

Professor Schwarz concluded that Mauritania was once 200 feet lower and the area from Dakar to Villa Cisneros, near Rao, formed a closed basin; and that the Canary Islands are a fragment of the western margin. The hills of Atar and to the east of the "Adrar" were part of the eastern margin; and the highlands of Futa Jalon and the watershed between the Niger, to the south-east and the Senegal, Gambia, and Kasamansa rivers to the north, south, and west, were the southern border. El Juf was then a lake.

Into this basin sand was blown from the central highlands of the Sahara, and where it was occupied by shallow sea lived *Arca*, *Murex*, *Conus*, etc., and, on suitable banks, oysters in huge quantities. This basin was then broken in half by a fault (Fig. 2). Professor Schwarz explains Arguin Bay as due to a north–south fracture. The seaward side sank, and the landward side rose 250 feet. The uplift produced a wide plain of unconsolidated red sand with occasional beds of shells, both on top and intercalated. The hardened sands of Iznaia show horizontal bedding; but elsewhere the sand sank without being washed about by currents and no bedding is seen. The patches of yellow sand found at Tin Mahan (18° N.) and Tivourvourt (17° 41′ N.), where fresh water occurs, are possibly on the sites of lakelets. The water sank through the sands and decolorized them, or more probably the yellowish sand with shells contains some admixture of clay which makes it less permeable and thus it prevents the descent of the water. The shells are not found inland beyond the Aftout, which is about 15 miles broad. When the land rose, rivers like the Gambia, Kasamansa, and Ferlo (the Daradus of Ptolemy) poured straight to the sea, clearing away the sand and exposing the underlying Eocene beds. In the north there were no rivers, as all the water sank into the sand. Nevertheless, definite channels had begun to form, until the process was stopped by the general desiccation of the region.

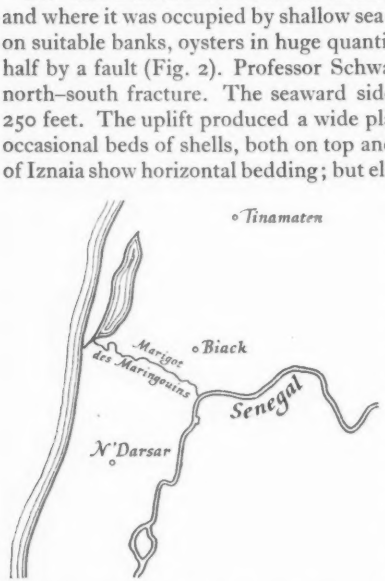


Fig. 3. Diagram of the lower Senegal showing the Marigot des Maringouins spill-way

By some cause a great deal of the water of the head streams of the Niger, which had become impounded in a vast lake behind Bakel, burst through this rocky barrier and found itself captured among a maze of sandhills. Bancal has traced several basins of inundation; the barrier sand dunes gave way one after the other, and gradually the Senegal as it exists to-day was evolved.

The Ferlo was certainly a river once, as Neolithic villages with cromlechs occur all down it. It must have been an independent river, fed by its own head streams, and has dried up owing to lack of rainfall.

The waters of the Senegal successively broke through the barriers "Sieuls de

Fuff," etc., and the present basin of inundation is barred by sand dunes along the coast, although why a great river like the Senegal cannot break out through the Marigot des Maringouins is strange. The Senegal River is however not strong enough to carry away the barrier of sand at its present mouth.

Professor Schwarz naturally compared this tract of the Mauritanian coast—especially near Alzas—with the coast of South-West Africa, between which there are striking resemblances. The main differences are that in South-West Africa the prevalent wind comes from the sea so that it scours and cleans the country, whereas in Mauritania as the wind comes from the interior it smothers the coastland in wide sheets of wind-borne drift. In South-West Africa pebbles occur along the coast, and in Alzas they are abundant inland. In South-West Africa the sand contains various minerals and agate, whereas at Alzas the only constituent is quartz. In South-West Africa any minerals occur as concentrates between the dunes; but at Alzas the *rag* is the floor on which the dunes were built and has not been disturbed since its formation. The two areas agree in that any pebbles have come from the interior and have a desert patina; and the sands contain beds of oysters, and in Mauritania abundant *Arca* and other shells as well.

The earth movements which broke up the extended Mauritanian basin must be geologically young, as they were later than the deposits containing the shells of *Arca senilis* and other living molluscs. According to Professor Schwarz's conclusions the Canary and Cape Verde Islands were connected by land with West Africa in geologically recent times.

ZERZURA

H. J. L. BEADNELL

THE problem of the lost oasis of "Zerzura" was dealt with recently at some length in the *Journal*,* in a group of papers preceded by an introductory note by the Editor. In January 1929, just before closing down the work on which I had been engaged during 1927 and 1928 in the south-west portion of the Libyan desert, I received from Mr. Newbold a copy of the paper describing his 1927 expedition with Mr. Shaw,† from El Obeid to Wadi Halfa; and more recently Dr. Ball has forwarded me a copy of Professor Borchardt's 1929 paper in *Peterm. Geogr. Mitt.*,‡ with the suggestion that I should send a note to the *Journal* on the results of my recent work, so far as it bears on the Zerzura question.

On reading Mr. Newbold's paper, I realized that the site most favoured for the lost oasis by him and others who have written on the subject—*i.e.* lat.

*"The Zerzura Problem," *G.J.*, 75, January 1930.

†D. Newbold and W. B. K. Shaw, "An Exploration in the South Libyan Desert," *Sudan Notes and Records*, vol. xi, 1928.

‡Paul Borchardt, "Oasen und Wege der Südlichen Libyschen Wüste," *Petermann's Geographischen Mitteilungen*, 1929, Heft 11/12.

21° 30′ N., long. 27° 15′ E., or about 230 km. south-west of Bir Terfawi (lat. 22° 55′ 12″ N., long. 28° 52′ 51″ E.)—lay only 105 km. south-west of Bir Messaha, the new well I had just finished and which I was on the point of evacuating. The opportunity was too good to be lost, and I decided to postpone my departure to Kharga for a couple of days in order to clear up the question of an abandoned oasis in this position.

Leaving Bir Messaha (lat. 22° 10′ N., long. 27° 57′ E., ground-level 329 metres) at noon on January 8, with the two best cars available—much used and abused old-model Fords—we crossed the Egyptian–Sudan frontier and proceeded south-west for 105 km., camping at 5 p.m. on the east side of a line of sand-dunes running north-north-east by south-south-west, a continuation of the belt which I had crossed twice farther north, on traverses from Bir Messaha to Owenat and back.

The run throughout had been over a flat sandstone plain covered with a thin veneer of sand, rising imperceptibly southwards at an average rate of 1 in 1000, and absolutely featureless with the exception of one small low outcrop of black ferruginous sandstone. As is often the case with the very occasional isolated "islands" of hard rock in this desert, the place was the home of a pair of lanners (*Falco biarmicus tanypterus*), the surfaces being coated with thick accumulations of white dung and littered with the remains of a heron and numerous quail, on which birds the falcons—the only indigenous inhabitants of the south-western desert outside the oases tracts—subsist during the migratory seasons. Our sudden arrival at the dunes nearly led to trouble, as we ran on to a stretch of foot-high sand-waves, always with difficulty visible when travelling southwards and especially so when facing the setting sun in a bad evening light. This kind of country is common in sheltered areas of drift sand adjacent to true dunes, and frequently results in a broken front spring, if not worse damage.

Leaving a wooden beacon at our camping place, we proceeded the following morning about 12 km. southwards, passing close to the supposed site of the lost oasis, and turned westwards with the intention of crossing the dune belt and returning northwards along the western side. The dunes at this point are 10 km. in width, with only occasional open spaces, in one of which was an exposure of black sandstone and a few tufts of *shari* grass (*Aristida Zittelii*). Having lost much time by getting badly bogged at one spot, I decided, after reaching a point within a couple of kilometres of the western limit of the belt, to turn back, as a reconnaissance on foot would have been necessary to find a way for the cars through the remaining dunes, and I had to get back to Bir Messaha by nightfall. Although the visibility was bad, a second line of dunes was in sight from the crest of the sandhills at this point, probably about 15 km. distant, and as far as could be observed the intervening desert was an unbroken plain.

Taking into consideration (*a*) what was actually seen of the country during this journey; (*b*) the altitude of the plain (420 m.) at the most southerly point reached; (*c*) the level of the underground water-table (244 and 262 m. at Bir Terfawi and Bir Massaha respectively, and here probably about 280 metres above sea-level); and (*d*) the entire absence of clays or other soft rocks in which depressions might have been formed, it seems highly improbable that any oasis exists in this part of the region. Practically all the true oases of the Libyan desert

are in depressions or low-lying tracts which owe their existence to the presence of comparatively soft and easily denuded strata.

On the return journey we followed the eastern margin of the dunes for 29 km. from our camping site, travelling over an undulating plain of sand with occasional pebbly patches. At that point we struck a small area of rough sandstone, built a cairn, and turned east-north-east. The rocky ground extended for 10 km., after which the remaining 70 km. to Bir Messaha, which we hit off by 5.30 p.m., was over a sand plain identical in character with that traversed on the outward journey—absolutely without relief.

Although the results of this journey appear to be destructive to the view that the lost oasis would be found in lat. 21° 30′ N., long. 27° 15′ E., or thereabouts, the exploratory work—covering some 35,000 sq. km. which I was able to undertake while sinking the new wells Bir Sahra and Bir Messaha, has resulted in the discovery of a tract of country which may very well be the site of a derelict oasis, though whether it can be identified with the much-debated Zerzura I am unable to say.

The district in question lies to the south-east of Bir Terfawi, and south and south-west of Bir Safsaf. It has an area of about 800 sq. km., or 1000, if we include Bir Safsaf and two patches of tall grasses and tamarisk which lie between Safsaf and Terfawi. Dotted over this country are some score of isolated cones, 20 to 25 m. in height—sandhills with tamarisk and *sellim* acacia (*Acacia Ehrenbergiana*). On many of the hillocks the vegetation was dead and decayed; on others even the acacia, the less hardy of the two, was alive and in flower (May 1928). Much of the country has been engulfed by drift sand, though the latter forms definite dunes only on the north side, more especially in the neighbourhood and south of the tamarisk clumps 23 km. east-south-east of Terfawi. The central and more southerly portions of the district are scoured and swept by the wind, the isolated vegetated cones forming conspicuous and bizarre landmarks on the otherwise featureless sandy plain.

The average altitude I estimate at between 230 and 250 metres above sea-level, and there is little doubt that the water-level over the greater part of the district is very little below the surface. Unfortunately, my reconnaissance was made on 23 May 1928, a day of great heat during a period of high winds and sandstorms, when barometric observations for altitude were so untrustworthy that I cannot guarantee the accuracy of the surface heights shown on the map. Further difficulties arose owing to the lamentable condition of the car which I had been using on exploratory work continuously for seven months, and to the fact that the speedometer chose that particular day to stop working. But I have reason to believe that the positions of the scrub-covered hills shown on the accompanying plan are not materially in error.

Personally I am inclined to believe that this area was at one time a well-vegetated tract extending north and north-west to Safsaf and Terfawi. Probably it was a good grazing district and may have been partially cultivated, as was the case at Terfawi, where I have found the remains of at least one ancient well, and been able to trace the area actually cultivated therefrom. My brief examination did not however reveal the existence of any old settlements, the only evidence of former occupation being quartzite implements, sandstone

grinding-stones, and the occasional remains of camels. But more detailed examination and the excavation of some of the cones would be desirable before coming to any definite conclusions regarding the former importance of the district. It is almost certain that flowing or artesian wells, such as those which provide the means of extensive cultivation in the Egyptian oases farther north, have never existed here, but there was probably an abundant supply of sub-surface water available. The sandstones of this region are identical with the artesian-water sandstones of the oases. Owing however to the northerly dip the beds lie at a much greater depth in Kharga and Dakhla, where they are overlain by thick bands of impermeable clay which prevent the water, flowing northwards under constantly increasing pressure, from reaching the surface except through shafts and bore-holes.

Assuming that these isolated mounds of tamarisk and acacia are remnants of a formerly well-wooded district, what explanation can be offered for its present desolation? I would suggest the possibility that a gradual fall of the water-level has taken place owing to the very large number of artesian wells sunk in Kharga and Dakhla in and since Persian and Roman times. Contributory causes may have been the increasing desiccation of the region and encroachment of blown sand—a perpetual menace to all but the most sheltered settlements in the Libyan desert, and one which has led over and over again to the abandonment and often complete obliteration of what were once amongst the finest wells and lands in the southern oases.

As there is no immediate prospect of publishing in detail the results of my 1927–28 expeditions, on the first of which I was accompanied by my wife, a few brief notes on the new wells sunk and on the previously unexplored territory mapped may be of interest.

Bir el Sahra

This new well is situated 30 km. west-south-west of Bir Terfawi, in lat. 22° 52′ N., long. 28° 36′ E., ground-level 262·7 metres. Excavation commenced on 28 February 1927, and fresh water was struck on March 19 at a depth of 17·5 metres (R.L. 245·2 metres), indicating a rise in the water-table between Bir Terfawi and Bir Sahra of a little over a metre. The rock is sandstone throughout. The name Sahra (Sahara), meaning the Waste, was suggested by Mrs. Beadnell, whose presence on the expedition was much appreciated by the men (Ababdeh Arabs from the Eastern desert) to whom she dispensed the various medicines so beloved by natives. On more than one occasion she remained in sole charge of the camp while I was away for a couple of nights making reconnaissances of the surrounding country, thus being responsible for taking the daily barometric observations and for the very large amount of cash I had of necessity to carry.

Bir el Messaha

The sinking of this well proved a very arduous and hazardous undertaking. Its site lies 101 km. south-west of Bir Sahra, in lat. 22° 10′ N., long. 27° 57′ E., ground-level 329 metres. Excavation commenced 24 December 1927, and water of excellent quality was obtained at a depth of 67 metres (R.L. 262 m.) on 24 December 1928. The time occupied in excavation and timbering, etc.,

amounted to 214 days—an average of 0·31 metres per day. Sinking was continued to 68 metres or 1 metre below water-surface. The rock is sandstone throughout but varies greatly in hardness. From Bir Terfawi (244 m.) to Bir Messaha the rise in the water-table amounts to 18 metres. Bir Messaha means the Well of the Survey: the name was given by H.E. Hussein Sirry Bey, at the time Surveyor-General.

Atmur el Kobaish

This extraordinarily flat and featureless plain lying between Bir Murr and Bir Terfawi, previously unexplored, was traversed twice by myself and my wife in 1927. A very large solitary bush of *araq* (*Salvadora persica*), visible for 20 km., was met with in lat. 23° 9′ N., long. 29° 44′ E.—surely one of the most isolated shrubs in the world. The bleached bones of several camels, probably animals strayed from caravans passing along the Darb el Arbain, lay half buried in the blown sand collected round the base of the bush. Tracks of desert mice and lizards were also noted. Farther west we crossed a large area (600 sq. km.) of granite, strewn with boulders whose surfaces were peeling like dried onions, lying to the north-east of Terfawi: this had been denuded to the same level as the surrounding sandstone plain. Apart from the *araq* bush the only conspicuous landmarks were met with on the western side of the plain, a group of granite hills, "Nusab el Belgum," and a saddle-back hill of quartzite and conglomerate, 62 km. north-east and 40 km. east-north-east respectively of Bir Terfawi.

Traverses between Bir Messaha and Owenat in February and March 1928

On the outward journey I proceeded direct to Jebel Kamil, thence nearly due south for 40 km., and afterwards west to Owenat, 300 km. from Messaha. The return was along a more southerly course. A belt of unknown country dotted with innumerable sandstone hills, 20 km. in width, was mapped. Crystalline rocks were found in several localities, and over a large area basaltic intrusions have induced columnar structure in the sandstones. The most interesting and conspicuous landmark met with was a huge boss of grey crystalline rock in lat. 21° 47′ N., long. 26° 13′ E., 184 km. west-south-west of Bir Messaha. This, in the absence of any available native name, I have called Bunion Hill. *Shari* grass (*Aristida Zittelii*) was growing in abundance on the drift sand extending from the base of the hill on the north side. The springs and neighbourhood of Owenat appeared to be entirely deserted. No traces of old caravan routes from Terfawi or Sheb to Owenat were anywhere observed.

Dunes

Many new dune areas have been mapped as a result of these expeditions. They are of two kinds: (1) more or less continuous belts of sand; and (2) more or less restricted elongated areas of isolated crescentic dunes. Ball has drawn attention* to the very noticeable alteration in the orientation of the dune-belts as one goes south, and my own observations support his conclusion that local topography has little to do with the variation in the direction of the prevailing winds. In the northern part of the Kharga depression and in Dakhla (also to

*John Ball, "Problems of the Libyan Desert," *G.J.*, 70, July, August, September 1927.

the north of these oases) the dunes lie north-north-west by south-south-east; between lat. 25° and lat. 23° (approx.) nearly due north and south; in the Terfawi and Messaha region the belts run north-north-east by south-south-west; while at a point 100 km. east of Owenat the orientation is north-east and south-west.

Hilly Tract West of Terfawi

A hilly area of sandstone, with peaks over 600 metres above sea-level, was found 150 km. west of Bir Terfawi. Its existence was first indicated by mirage and refraction, on a day in March 1927, from a point 60 km. north-west of Bir Sahra. Nine months later I went north-west from Messaha and definitely proved that a group of hills existed in the position suspected. The first view of this high ground was an extraordinary spectacle. We had proceeded 62 km. north-west from Bir Messaha, over a flat featureless plain of sand, when above the ill-defined horizon appeared a row of dark fantastic objects, resembling inverted haystacks suspended in mid-air—refracted hill-tops floating in the blue, between mirage and sky, all along the horizon towards which we were travelling. Thus they remained for some considerable time—in fact, we had covered several miles—before they came down to earth and resolved themselves (still 50 km. away) into the higher peaks of the range of hills for which we had been searching. Examination showed this high ground to owe its preservation to hard protective beds of dark ferruginous sandstone. Deposits of manganese occur in the neighbourhood.

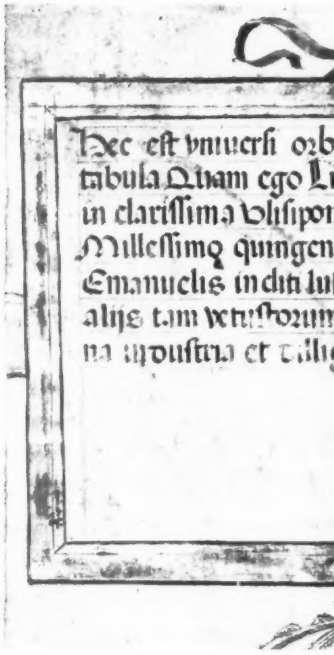
West of the Darb el Arbain

A wide belt of country, extending from Kharga to the Sudan frontier south of Bir Messaha, and lying to the west of the ancient route of commerce known as the Darb el Arbain (Forty Days Road), has been examined and mapped—the greater part of it for the first time—on my frequent traverses between Kharga and the new wells.

LOPO HOMEM'S MAP OF 1519

EDWARD HEAWOOD, Librarian R.G.S.

IN the *Journal* for August 1930 (vol. 76, p. 159) a short description was given of a previously unrecorded Portuguese map, sold at Sotheby's earlier in the year, which, if the Latin inscription on the back was to be trusted, was drawn at Lisbon in 1519, by order of the King of Portugal, by Lupus Homo, evidently a Latinized form of the name Lopo Homem. It was then pointed out that this appeared to be the earliest known work of a noted Portuguese family of chart-makers, a member of which, also bearing the name Lopo, produced an important world-map as late as 1554, while another, his son Diogo, was at work still later. We have since been surprised to read, in the *Rivista Geografica Italiana*, vol. 37, part iii, an article by Sig. G. Caraci, a well-known authority on early maps, in which the map in question is denounced as a clumsy modern forgery ("nessun dubbio che questo preteso cimelio portoghese altro non sia se non una grossolana falsificazione moderna"), though, as the writer admits,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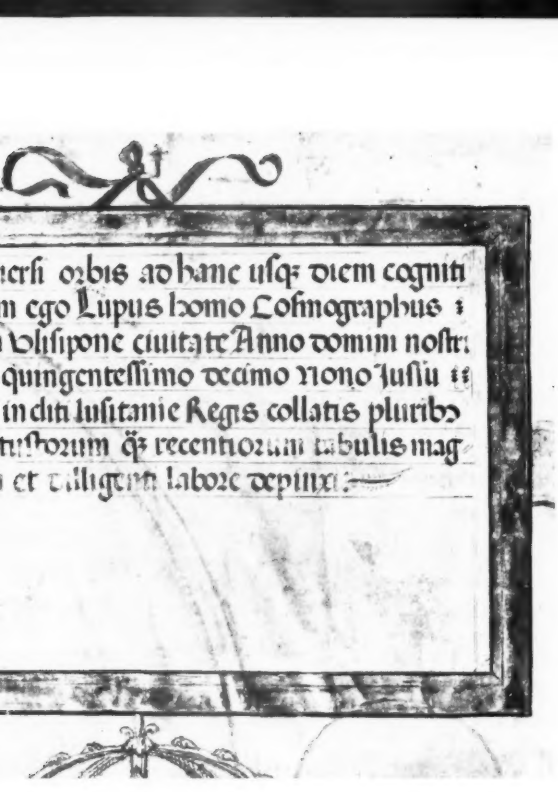

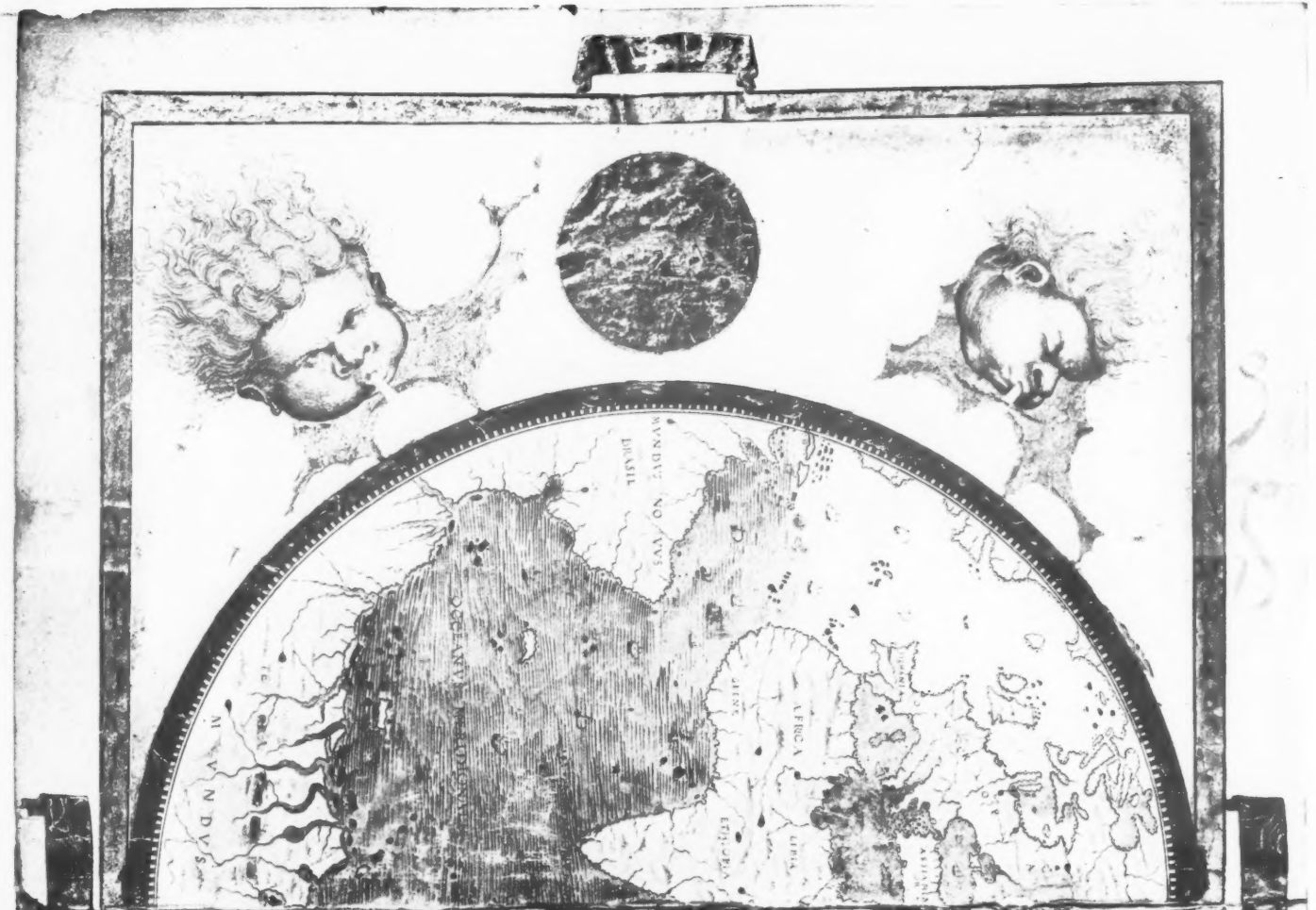
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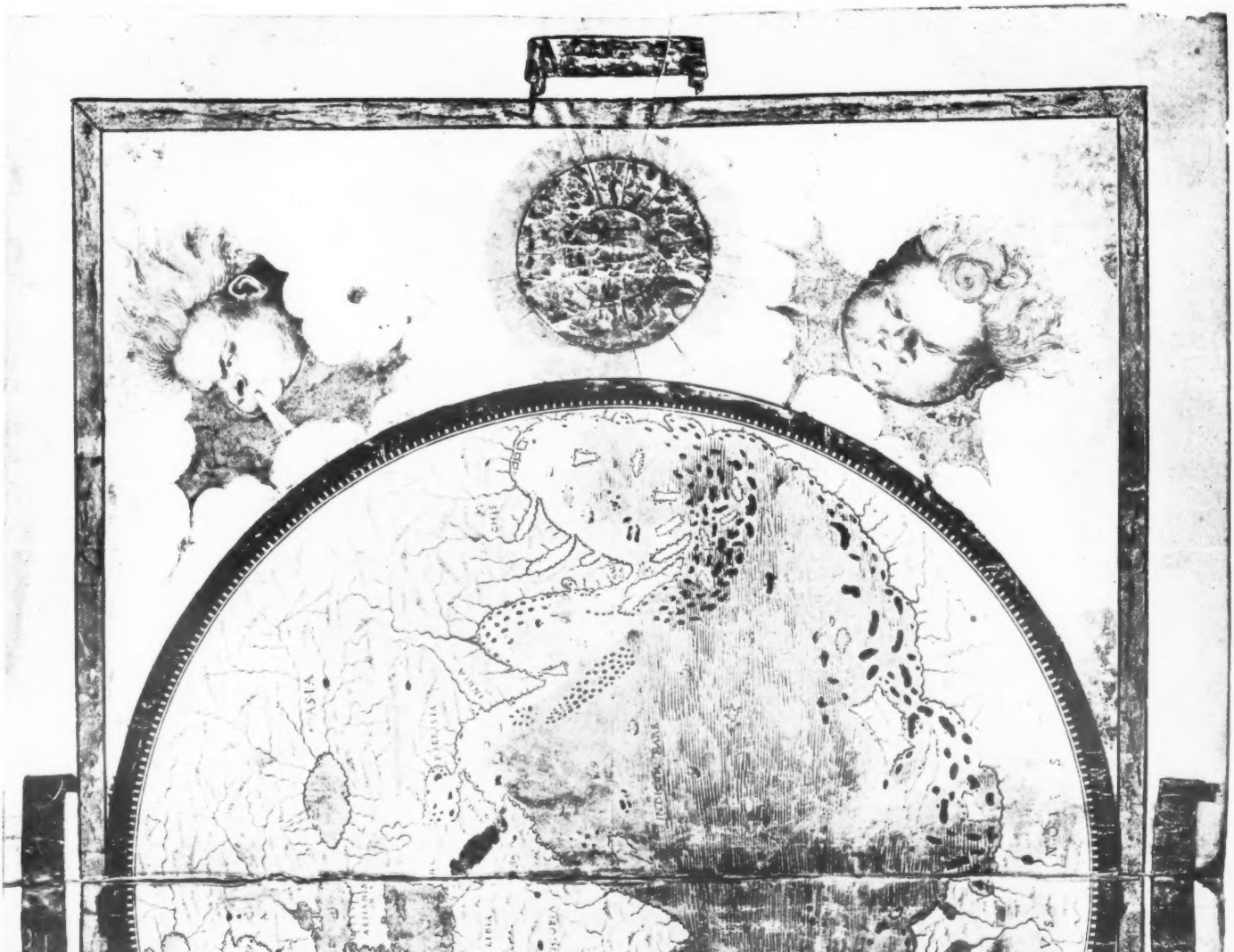
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INDICUM MARE

he had not seen the map itself, but had based his strictures on a much-reduced photograph. The arguments put forward carry little conviction, and as competent judges in this country who have examined the original see no reason to question its production at the date assigned, we adhere to the belief that the map is a genuine work of a member of the Homem family. By kind permission of the present owner we are now able to give a photograph, reduced to half-scale, which may help those interested to form their own judgments on the subject.

The reasons given by Sig. Caraci as justifying his conclusion are briefly as follows. First of all he regards it as suspicious that the inscription above mentioned is on the *back* of the map, saying that this is the solitary instance of such a position in the work of a professional chart-maker. The formula, he says, differs in its phraseology from any other used by Lopo Homem. Secondly, he thinks it inconsistent that a map made, as is claimed, by the express order of King Emanuel should be so small and should present such a mere outline of world-geography, which could serve no practical purpose. There is nothing in it to justify the boast that it was made "magna industria et diligenti labore," but it would rather suggest a doubt as to the competence of the cartographer. Sig. Caraci is equally critical of the geographical details represented. There was no justification in 1519 for the insertion of a continuous coast-line for North America, but a more glaring error is the joining of Eastern Asia to the southern part of the new world, by a continental mass south of the Indian and Atlantic Oceans, while the opening shown where Magellan Strait really is would be an anachronism in 1519. Not less surprising, he says, is the fantastic representation of the East Indies, with the great gulf recalling the *Sinus Magnus* of Ptolemy. It might be supposed that a man capable of such ineptitude would have been dismissed with ignominy from the public service, whereas the important office entrusted to Lopo Homem as early as 1517 proves him, Sig. Caraci insists, to have been thoroughly experienced in matters relating to navigation and chart making.*

We cannot attach much weight to any of these pronouncements. Their examination a little more closely will, we think, show how little real support they give to Sig. Caraci's position.

In the first place it is not correct to say that there is no early example of an inscription placed on the back of a map, which moreover is a quite natural position when maps are folded, like the present Homo Map, for insertion in an atlas. An exact parallel, it seems, is to be found later in the same century in the Sgrooten MS. Atlas in the National Library at Brussels, where the titles of all the maps appear on the outer page (see Bagrow: 'A. Ortelii Catalogus Cartographorum,' 2 Teil, 1930, p. 63). It seems a quite gratuitous assumption that the Lopo who claims to have made the map is necessarily the same as the known cartographer of that name. It is hardly consistent to suppose that a man still at the height of his powers in 1554 should already in 1517 have been possessed

*In a somewhat cryptic footnote (p. 80) Sig. Caraci seems to hint that he has actual knowledge of the map which he does not see fit fully to impart. He says that a little time ago he warned an English owner against a map so like the present that it might be the very same; and he makes the innuendo that collectors are sometimes not above buying doubtful specimens in the hope of ultimate profit.

of the skill and experience regarded by Sig. Caraci as a pre-requisite for the official countenance then given him. But even supposing there to have been but one Lopo, it is surely unreasonable to expect a close resemblance in technique between an early production of one class and the mature result of a lifetime's work, belonging to quite a different category. What is said about difference in style from anything else produced by Lopo means little when we remember that the map of 1554 offers practically the only basis of comparison. Criticizing the language of the inscription, Sig. Caraci says that a map like the present could have been produced in a few hours. True, perhaps, if for hours we read days and if an earlier map had merely to be copied, but no such map would be ready to the draughtsman's hand, and at the least he would have to piece together material derived from various sources. This he has done with a certain skill, for apart from the play allowed to fancy on its outskirts the map does give a fair general idea of the knowledge of the world in 1519.

To come to a few details—the "distorted" picture of the Far East can be matched in well-accredited maps of the time. The Farther Indian peninsula has a shape very like that given to it in the map of Nuño Garcia de Toreno, specially made to show the results of Magellan's voyage through the Archipelago.* This also brings the mainland coast southward to enclose a great gulf after Ptolemy's model, while Homem's version has a still closer counterpart in the Reinels' chart of *c.* 1516, of which a sketch was given by Denucé in 'La Cartographie Portugaise' (Ghent, 1908). Here the extreme east of Asia is brought down southward beyond the *Sinus Magnus* to the very edge of the map, and it was but another step in the process to extend it into a southern continent. The presence of an opening where Magellan afterwards found one is not necessarily an anachronism, as various other hypothetical openings in the Southland are to be seen in the form of river-mouths.

The very fact that the map now brought to light differs from known work of the Homems is surely rather a proof of genuineness than the reverse. Would not a forger take pains to avoid any marked departure from the style of other maps of the period? The same may be said of the coat of arms drawn on the back of the map—those borne by Catherine de Medici as a widow, *i.e.* after 1559. A forger would surely have seen to it that the arms agreed in date with that assigned to the map itself. If, as is asserted, the map was made by the King's order, it is not unnatural to suppose that it was sent by him to some French royal personage, and that the Queen's arms were added after it came into her possession. This would be merely on a par with the stamping of an owner's arms on the bindings of his books. An alternative, and quite possible, explanation has been suggested by a connoisseur in such matters, whose remarks are printed below.

One could have wished that it had been possible to trace back the history of the map before it came into the hands of its late owner, Major J. A. Morrison, of Basildon Park, Reading. Inquiry of him has elicited the reply that he remembers the purchase of the map in Italy by his father, during a visit to that country, but that he can give no details about it, nor does he know the date of the visit.

In its general appearance the map shows every sign of age, having become

*See reproduction by Prof. Magnaghi in *Atti del X Congresso Geogr. Italiano*, Milan, 1927.

almost parted in two along the central fold, where there are also signs of former repair, or of guarding for inclusion in a bound volume. The photograph now given makes it unnecessary to say more about its content, except as regards the colouring. This again is somewhat unusual, the whole of the continental lands being covered with a pale green wash, while the hills, sprinkled about more or less at random, are in a darker green. The smaller islands, also put in rather at haphazard, are in red, as is also the Red Sea, as in many other maps of the time. The sea is shown by a combination of ink-lines with a faint blue wash. (Somewhat similar ink-lines were used for the oceans in the MS. maps of Glareanus, *c.* 1510.) Gold is extensively used in the outer decoration, covering both the rectangular border (with the scrolls outside it) and the frills beneath the heads representing the winds. The circle to the right, which seems to represent the sun, is also in gold, while that to the left, possibly intended for the moon, is in silver.

Whilst we decline to accept Sig. Caraci's verdict of forgery, we appreciate the value of his remarks on the personal history of the Homem family, to the collection of which he has evidently devoted considerable trouble.

An expert to whom we referred Sig. Caraci's article writes as follows:

Sig. Caraci's hasty condemnation of the Homo World-map rests, if we analyse his arguments, mainly on two tacit assumptions: that the Lupus Homo, or Lopo Homem, who in 1517 was "mestre de cartas de marear" at Lisbon, and who in 1519 designed this world-map for King Emanuel of Portugal, must be identical with the Lopo Homem who made the large world-map of 1554 now in Florence; and that the cartography seen on this map is too faulty to satisfy the probable requirements of King Emanuel.

First of all let us see whether there is any reason or probability to assume that the author of this world-map and the author of the Florence map of 1554 are likely to be the same person, or whether they only bore the same name. For Lupus Homo and Lopo Homem *are* the same name, though Sig. Caraci, in his desire to disparage the 1519 map, supposes it a mistake of the writer who calls himself Homo instead of Homem. Lupus Homo is the correct Latin form of the Portuguese name Lopo Homem, and neither "wrong" (p. 74: Homem il nome giusto) nor "distorted" (p. 78: il proprio nome, sia pure storpiato), nor "corrupt" (p. 84: semplice corruzione di Homem).

The Lupus Homo or Lopo Homem then who drew this map in 1519 by order of the King of Portugal is obviously identical with the Master of Navigation-Charts appointed by the King of Portugal in 1517 and confirmed in that charge by his successor in 1524. Is it likely that a man nominated to such an important post in 1517 would still be sufficiently active and sure of hand and eye thirty-five years later to draw the large map of 1554 now in Florence? Sig. Caraci himself (p. 78) claims for him in 1517, when he was appointed, a long acquaintance with the Portuguese pilots and navigators. One may agree entirely with Sig. Caraci that it is only reasonable to suppose that the man appointed to the important charge of cartographer to the Portuguese Navy in 1517 was likely to be a man in the prime of life. If Lopo Homem was forty to forty-five years old in 1517 he would be between seventy-five and eighty when and if he drew the Florence map. Sig. Caraci stresses the great dissimilarity,

not only in the state of knowledge but also in technique between the two maps; the obvious reason is, that they belong to different generations.

In his useful Appendix on the various cartographers of the Homem family Sig. Caraci mentions a Diogo, an André, an Antonio, a Thomé, a Francisco, a Rodrigo, and a Pedro Homem; of these Diogo was certainly a son of Lopo Homem and old enough to kill a man at Lisbon in 1545 and on his pardon, in 1547, to "continue his work as cosmographer and navigator for the King" (p. 82). One might infer from this document that most probably his father Lopo was dead by 1547 and that Diogo had inherited his charge. This Diogo (or possibly again another one of the same name) drew maps and atlases at Venice from 1568 to 1573. Another of these Homems, André, designed a world-map in 1559 and is blamed by Sig. Caraci for signing it "Andreas Homo Cosmographus Lusitanus," a "semplice corruzione" of Homem. In what relation of kinship, if any, he stood to Lopo and Diogo we do not know, but we know that Antonio and Thomé were his brothers, Francisco his uncle.

With this wealth of Homems known to have existed about the middle of the sixteenth century is it not likely that one member of this younger generation would again be called Lopo, and that he is the author of the 1554 map? Sig. Caraci himself points out that on the 1554 planisphere Lopo Homem signs himself simply "cosmografo" without any mention of an official status. Is it not very unlikely that, if this map was the work of that Homem who had been Royal cartographer since 1517, he would have suppressed the mention of his position in signing his handiwork?

We may take it then that it is impossible to identify the two Lopos and that the map of 1554 is obviously by another, later, Lopo Homem, who was not Royal cartographer, but some member of a large clan of Homems who exercised the family profession of map-making in Portugal, Antwerp, Venice, Paris, and elsewhere, and, no doubt, derived some reputation through their kinship with the old Royal cartographer of Portugal of 1519. And thereby all the inferences drawn by Caraci from the dissimilarity in technique, etc., fall to the ground.

In regard to the map itself Sig. Caraci says (p. 76): "Qualunque sia la grandezza della pergamena—che dev' essere minima. . . ." One does not know what Sig. Caraci calls very small, but the double leaf of vellum on which the map is drawn measures 580×415 mm. (23·2×16·6 inches), the size of the whole drawing being 545×370 mm. (21·8×14·8 inches), and the diameter of the circle 328 mm. (13·12 inches). The map is not of the portulan-map type, but is obviously designed from the first to be bound in a book, *i.e.* to form part of an atlas. This is apparent not only from its general appearance but most clearly from the way the inscription is placed. The letters in which this is written* are of very distinctly Spanish-Portuguese character. Below the tablet bearing this inscription there is a large coat of arms painted, not very carefully, in a much later hand; this is vaguely referred to by Sig. Caraci "sotto la quale (leggenda) sarebbe disegnato lo stemma di una principessa di Francia." Now this coat of arms measures 220×165 mm. (8·8×6·6 inches) and occupies more than half the page, while the arms are those not of some unknown

*A half-scale reproduction of the inscription is given on the back of our photograph of the map.

"French princess" but of Queen Catherine de Medici, surmounted by the Royal Crown and surrounded by the "Cordeliere de Veuve," the heraldic sign of her widowhood; therefore these are the arms which she bore during the years 1559 to 1589, as they can be seen on a number of objects and book-bindings belonging to her.

These arms seemed at first sight puzzling, just because they are so large and conspicuous and so obviously painted by a later hand. For the connection of Catherine de Medici with a map made in 1519 for a King of Portugal seemed rather obscure. Thanks to Sig. Caraci's article and especially to his most interesting Appendix in which he has assembled the various stray notices on various members of the Homem family, the significance of these arms becomes clear, and if any corroborative evidence were needed to prove the genuineness of the map it is afforded by the later addition of the arms of Catherine de Medici. Sig. Caraci, quoting from F. M. de Sousa Viterbo: 'Trabalhos nauticos dos Portugueses, nos seculos XVI e XVII,' Lisboa, 1898, pp. 160–162, informs us that in 1565 three brothers Homem—André, Antonio, and Thomé—were in Paris, and that André was employed there by the King of France in making "cartas, mapas e globos." That he was a cartographer held in some esteem is proved by the fact that the Portuguese ambassador in Paris made efforts to induce him to return to his native country. In a letter dated 28 February 1565 André Homem replies, naming his conditions and mentioning incidentally a map he was at the time making for King Charles IX, the son of Catherine de Medici, and at that time a boy of fifteen. It seems a legitimate assumption that André Homem, when introducing himself to the French court for employment, should have presented this old map of his kinsman Lopo Homem to the Queen-Dowager and that he had her arms added on the front page.

To sum up: This map is a valuable monument of the actual work done by Lopo Homem, the official cartographer of the Royal Portuguese Navy, appointed in 1517, and so far the only specimen of his workmanship available. That the 1554 Florence map could be the work of his extreme old age is more than improbable, and it must be attributed to another Lopo Homem belonging to the next generation. There is said to be in existence somewhere another map signed "Lopo Homem meffes em Lisboa" without date (see Caraci, p. 74, note); whether this map belongs to the earlier or the later Lopo Homem could only be decided if it could be examined. Unfortunately however it appears to be now lost or inaccessible.

THE GREAT BARRIER REEFS

A YEAR ON THE GREAT BARRIER REEF. By C. M. YONGE, D.SC. *London : Putnam* 1930. 10×6 *inches;* xx+246 *pages; illustrations and maps.* 21*s*

THIS may be called the popular account of the Expedition, in distinction from the four quarto volumes to be published by the British Museum, and Mr. Steer's and Mr. Spender's papers in this *Journal* (vol. 74, 1929, pp. 232–257, and 341–370, and vol. 76, 1930, pp. 193–214, and 273–297); but it is not a book to be neglected by the author's scientific colleagues, while its value to students will be very great. Coral reefs are a problem in Biology, Geology, and Geography, and specialists in and of these three may here obtain that general

view which has sometimes been wanting. Recent literature has been almost entirely geological; a biological counterweight is the more welcome. Biologists will find here also a vivid description of a tropical shore, which will compensate to some extent experience confined to temperate seas; geographers and geologists, too prone to turn back on the shore-line, will find inducement to extend their field.

The story reads like a delightful picnic, but those who know see clearly the background of continuous hard work and no little discomfort, only hinted at by the author. The latter might have been reduced considerably had there been only a little more money to spend on the huts. Low, unlined, galvanized iron roofs, though regularly used in northern Australia, cannot be too strongly condemned; if galvanized iron must be used it should be not only lined with felt, but have a wooden ceiling below it, not less than 10 feet above the floor. One wonders how much of the labour troubles of tropical Australia is due to these "tin" roofs! But nothing subdued the enthusiasm of this party, and, as the native lay-preacher, who was a servant to the party, declared in his parting speech, "The work was DONE."

The book is beautifully complete, and, like the best travel stories, leaves the reader feeling that he has actually accompanied the writer, and shared his interests, not only in the country, the sea, the reefs, and their most strange inhabitants, but in the work of the expedition, from the composition of sea-water, the feeding and health of the hitherto so little-known coral animals, to the geographical foundations of the whole reef. The human populations complete the picture, the Australian aboriginal appearing as a man and a brother—as do all savages—when sympathetically treated; and Dr. Yonge describes institutions, in operation, which give hope that a remnant of the race may survive the deadly influences of civilization.

Theories of the formation of coral reefs are dealt with shortly as an introduction, "exact knowledge" of which "is very limited, and that, as always, gives full scope to the imagination, which is apt to be trammelled by too rigid an array of facts." It is probable that the author under-estimates the array of facts already accumulated, his own field, the feeding and physiology of corals, having been so long neglected (not willingly, but of necessity). Many of the welcome new facts, so solidly founded on observation and experiment by the expedition, excite our imagination to ask continual questions. Why, for instance, are the reefs, the outer ones especially, so like, and yet so different from, others which have been carefully described? Why are the "ramparts" of Low Island and its fellows so hard to match elsewhere? It having been proved that corals can live, apparently happily ever after, without the algal cells which they contain, why do reef corals, in nature, invariably seek the light as do plants? Boring into the reef should throw light on its foundation and history, but all bores made have only brought to light fresh mysteries. Do those on Low Island really prove it to be nothing but a huge mud pie, with a crust of coral rock? This notable contribution to coral reef literature leaves these and other questions unanswered. What has been accomplished is a corner-stone in a wall still under construction.

We may wish we had more about the visible parts of the outer slopes of all the reefs, especially of those of the outer barrier. The appearances seen by refraction in a wave about to break may be misleading. Could not the water glass have been used more often? A dozen of the type used by the Red Sea pearlers could have been bought for, say, £1, and would have been found far more useful than the usual peep-hole; plate glass should not be used, it is too heavy.

One hundred and ten pages are given to the Low Island and the life on its reefs and in the seas around them, the most complete account of a coral area yet

written. The wealth of illustration makes possible the omission of technicalities from the text, without reduction of the scientific value; it is all good reading, to amateur and specialist alike. The photographs of living corals are most beautiful; those of their expanded polyps are also quite novel; and the other inhabitants of the reefs receive their due share. Having become thoroughly acquainted with Low Island, we are taken north as far as Cape Melville, to obtain a more general view of both coast and barrier, this excursion being later supplemented by visits to the Murray Islands in the extreme north, and the Capricorn Group at the southern end of the barrier. The Murray Islands have been already described by A. G. Mayor, but their beauty and interest are inexhaustible. It is curious to find coral growth so active as far south as the Capricorn Group, where the barrier as a whole seems to be disintegrating, but it is pointed out that a slow growth-rate of abundant corals may not compensate for the activity of destructive agents, both living and mechanical. The photograph on Pl. LXI shows an abundance of coral growth impossible to surpass anywhere. Finally, we accompany the author on his homeward voyage, which was arranged so that he could see as many of the Pacific Islands as possible. This is but a valedictory chapter, but the well-chosen illustrations will interest those already familiar with earlier accounts. The author's passion for work broke out again in the Biological Station at Hawaii, the extreme limit in the north-west of the Pacific coral area.

There are no fewer than 137 photographs, and illustrations are seldom of such uniform excellence, especially when the difficulty of most of the subjects is taken into account; none are superfluous, and none are without direct bearing on the text. For the bulk of these we offer Mrs. Yonge, who was the medical officer of the expedition, our grateful congratulations; seventeen are by Mr. G. W. Otter, three by the Australian Air Force, and twenty-five by others. There are also seventeen diagrams and drawings, four of which are of anthropological interest also, and six maps. For the reproduction of all, and the general style of the book, we congratulate the author on his publisher.

Where so high a standard of accuracy is maintained I should not point out mistakes were it not that the certain popularity of the book makes some of them dangerous to future workers. On the map of coral distribution through the world, the Red Sea is credited with areas of fringing reefs only. It contains much over 1000 miles of barrier reef, and some atolls, one at least of which (Sanganeb, off Port Sudan) stands in deep water, and is of large size. The absence of reefs round the Marquesas cannot be attributed to their abrupt rise from deep water, which is not always the case. The real reason is that, for some cause unknown, the coral fauna is restricted to very few species. There is no island circled by reefs; the one reef found in the group is a thing *sui generis*, apparently one huge colony of *Porites*, with some addition from *Pocillopora* and *Millepora*. What Dana said about Tahiti was how greatly the outline of the island would be altered were it submerged a few hundred feet, not that it had been so submerged. As regards solution in lagoons, with due appreciation of all the expedition has done, I think more direct evidence, one way or the other, should have been produced. There is distinct evidence of deepening in many lagoons; others are as evidently filling up. Both cases occur in the one island of Tahiti, while, of oceanic atolls, Cocos Keeling is an example of filling up; in many others all the evidence points to deepening. "Cup," or solitary corals, occur in thousands on some reefs, notably the Tahitian barrier, always in the shade. Figure 7 on page 55 leads the reader to suppose that all the branched corals grow in the way shown, and the interesting point is omitted, that in only the most recent of the corals, *i.e.* in the genus *Acropora*, has this simple method been evolved. On Pl. XII, and in its description on p. 59, it should be made clear that the encrust-

ing forms of *Acropora* on the reef edge are not the same species as the "Stag's Horn" of the lagoon but are modifications of the corymbose species. Branching of nodular Lithothamnioneae is not generally correlated with rough or smooth water in the present writer's experience. Both forms of nodules live in strong currents, the solid often as sheltered as the branched, and *vice versa*. Is not the "giant *Vermetus*" of the reef edges a *Magilus*, as in Tahiti and the Red Sea? May not the small, and even minute, forms of *Vermetus* be of value, in their incalculable numbers, as a reinforcement of crusting Melobesiae?

CYRIL CROSSLAND.

THE GLACIATION OF THE HIGH TATRA

THE ICE AGE IN THE TATRA MOUNTAINS. By EUGENJUSZ ROMER. From Mém. Acad. Polonaise Sci. & Lettres. Sér. A, vol. 1, 1929. *Cracow: Imprimerie de l' Université* 1930. 10×7 *inches;* 254+xvi *pages; illustrations and map*

THE High Tatra (8740 feet) is the highest group of the Carpathian Mountains, and has the interest of being the most northerly of the higher mountains of Central Europe; and owing to its position in approximately the centre of Europe it is under different meteorological conditions from the more westerly members of the Alpine System. The former glaciation was discovered early in the development of glacial geology, for Zeuschner's description in 1856 of the terminal moraine of the ancient Bystra glacier is one of the pioneer contributions inspired by the work of Louis Agassiz. Stache, twenty years later, surveyed the Tatra for the Austrian Geological Survey, but his work was unpublished and is available only in manuscript. The chief contributions to the glacial geology of these mountains are those of Partsch (1882, 1907, and 1923), of Uhlig (1898), and Rehmann (1893). In 1908 R. Lucerna made an independent examination of the area and claimed to find glaciations corresponding to the Penck and Bruckner divisions—the Günz, Mindel, Riss, and Würm—and also evidence of great glacial over-deepening of the main valleys. Under the same influences the author of the work under review, who is now Professor of Geography in the University of Lwów, began in 1904 his studies of the Tatra, and at first shared Lucerna's views on these two sections of the subject; but he continued his researches and renewed them after the war, and has now issued a detailed monograph stating the evidence collected by his prolonged observations in the field. The book is illustrated by an instructive and ingenious map and a series of sixteen plates of excellent photographs.

The author's discussion of the problems shows that they are still obscure and uncertain, and he repeatedly calls attention to facts inconsistent with the current explanations (*e.g.* p. 178). Some of these puzzles are due to the difficulty of distinguishing moraines from landslips and from banks of boulders that have slid down steep slopes of snow. Others are due to the still inexplicable distribution of erratics and drift pebbles, and in one case the author suggests that at the time of the last glacial stage (his H2) the crystalline rocks of the Gievent fold were covered by an overthrust nappe (p. 127). In other cases he dismisses some drifts as "pseudo-morainic," and some boulders that had been described as glacial erratics he explains as "pseudo-glacial blocks" due to water transport, and he dismisses some views as requiring that the Bialka glacier had near its end "undertaken miraculous excursions, both uphill and downhill" (p. 29).

The difficulties are due to the great changes in hydrography, morphology, and level of the Tatra during the glaciation. For the deposits of each stage were so

thick that they smothered the previous relief and the valleys were excavated on new lines. And he holds that the size and shape of the Tatra and the distribution of the rock outcrops were different in pre-glacial times. The changes in level amount in the Bystra valley to over 400 feet and the deposits are at such inconsistent heights that the author insists that the valleys have been warped since the glaciation.

The evidence of glacial action consists of magnificent amphitheatres of moraines, abundant cirques with their moraines, the glaciated contours of valleys and peaks, widespread erratics, and extensive fluvio-glacial deposits.

The author emphatically rejects Lucerna's correlation of the glacial deposits with the four Penck-Bruckner glaciations, and declares that Lucerna's conclusions were based on his prepossessions and ignore obvious facts. He also rejects the view that the valleys have been largely over-deepened by ice, and attributes their excavation to river action. He holds that the effect of an ice sheet and glaciers on the rocks beneath is "preservative," or to use the usual phrase, "protective," wherein he agrees with many British students of Alpine glaciation, including Whymper, Bonney, and Garwood. Professor Romer attributes far more importance than his predecessors to the action of earth movements on the existing topography and in guiding denudation; and he calls attention repeatedly to the effect of post-glacial subsidences and uplifts, as well as to differential movements during the glaciation (p. 226).

The deposits of the older glaciation are best developed on the southern side of the Tatra. The author insists, despite earlier opinions to the contrary, that both the northern and southern slopes were occupied by ice at the same times and were subject to the same climatic changes. The differences in their glaciation were due to the morphological differences (p. 235). He insists that "the climatic cycles were the same on both sides of the mountains, whereas the morphological cycles evolved quite independently."

He attributes the glacial deposits to two glaciations, of which the first is represented by weathered remnants; the second is due to three stages, of which the maximum advance is still marked by well-preserved moraines. Professor Romer takes as his datum the stage when the ice covered the summit of Hurkotne; he calls it the Hurkotne or H period; it was followed by the H − 1 stage of lower-level deposits; and by the H − 2, the latest glaciation. He has found representatives of each of these stages in the northern valleys. He maintains that they are distinct developments and not mere recession stages. The deposits of the older period, or H + 1 glaciation, are now so denuded that their interpretation is difficult.

The author is less interested in the correlation of his divisions with those of other regions than with their formation. He considers that the main object of glacial geology "does not nowadays consist in the classification and the chronology of the glacial formations, but in the detailed reconstruction of the genetic explanation of the processes owing to which these formations have been preserved in some places and destroyed in others." The correlation of the chronology is however the problem which most concerns workers in other areas to whom the detailed structure of local drifts is less interesting.

The author claims that the glacial geology of the Tatra is unique with its two main glaciations, the threefold division of the second and the smothering of the topography by drifts between each of these four stages. The monograph is an important contribution to the glacial history of Central Europe, as it describes in detail the development in an area under different meteorological conditions from those of Western Europe. Students in many countries will be grateful to the author for having published this highly technical work in English, as well as in its independent issue in Polish.

J. W. G.

REVIEWS

GREEN FIELDS OF ENGLAND: a book of footpath travels. By CLARE CAMERON. *London: Constable & Co.* 1930. 9×6 *inches;* 250 *pages; and illustrations (by Edmond L. Warre).* 12*s* 6*d*

In this book the author records her impressions when walking in the Chilterns, the Thames Valley, the Cotswolds, East Anglia, Yorkshire, the Welsh Border, Central Wales, and Sussex. The book will make most appeal perhaps to readers who already know England, since they will best appreciate the details, be grateful for the recapture of faded or lost impressions, and for new aspects of familiar scenes which they may have originally missed. On the other hand, those who do not know the country well may fail to get from these pages that generalized impression of the respective districts that would help them find their bearings, as it were, in the geography of the home land, though it must be admitted that a good insight is given into many of the districts travelled, notably the desolate Suffolk coastal marshes, the Sussex Weald with its deep oak woods, and the wild hills of Wales. Miss Cameron seems to have made quite a practice of arriving in remote little places last thing at night, and relying on the unfailing kindness and hospitality of the country people who were sometimes reluctant to make any charge at all.

There are some beautiful descriptive passages in the book, but also many tiresome digressions of too egotistical and emotional a character to be altogether pleasant reading, and the same may be said about some of the verses which precede each chapter. The sketches are good, not least the frontispiece which shows us the parish church of Beccles. No book, of course, on the English countryside could fail to dilate upon our picturesque and interesting village churches with the life that gathers round them.

L. C. W. B.

AUTUMNS IN SKYE, ROSS, AND SUTHERLAND. By T. RATCLIFFE BARNETT. *Edinburgh: Robert Grant & Son* 1930. 7×5 *inches;* 187 *pages;* 16 *illustrations.* 7*s* 6*d*

Skye has been heavily written up in recent years. In the present book, the first half of which deals with the island and contains little that is new, the exclamation marks are laid on rather thicker than usual. The author's feelings are always liable to be overcome by something, "an indescribable something which grips you with a sense of the unutterable"; in fact he seems to be made quite uncomfortable by beautiful surroundings, if we may judge by such a remark as "The summer day seemed almost hurting in its beauty as I sat among the graves and dreamed." The second half deals mostly with Ross and Sutherland, but is not solely devoted to those counties nor indeed entirely to autumns. Celtic heroes now give place to hardy Norsemen in the author's daydreams. As he goes out of his way to tell us the origin of the name of Greenland, he might have given the source of the story correctly. The space devoted to the rather foolish Ten Commandments of Walking—the tenth practically contradicts the third, especially in the north of Scotland—would have been more profitably occupied by a glossary of the strange words that plentifully besprinkle his text often without the medium of italics. But the book is probably not intended for mere Anglo-Saxons.

J. H. R.

THE ARCHAEOLOGY OF ROMAN BRITAIN. By R. G. COLLINGWOOD. (Methuen's Handbooks of Archaeology. Gen. Ed. A. B. COOK.) *London: Methuen & Co.* 1930. 9×6 *inches;* xvi+294 *pages; illustrations and plans.* 16*s*

The great bulk of recent archaeological literature, and especially of expert reports, makes some such digest as this necessary, and the measure of the need will be the measure of the welcome accorded to Mr. Collingwood's book, with its gallant effort to bring order into the present confusion. It is by no means the beginner only who will want to keep this book on his reference shelves: Roman-British archaeology is so wide a subject that practically no expert is well versed in all the departments of which brief and masterly surveys are given in these pages. Very useful are the lists of the best reference books (*e.g.* on Roman roads), and summaries such as that of the recent explorations of York, Chester, and Caerleon-on-Usk, and of the knowledge of Hadrian's frontier and the Antonine Wall gained during the last decade. About the former the sound conclusion is that it was intended for an obstacle not to hostile armies, but to parties of raiders; the theory that the turf wall was the work of Hadrian and the stone wall that of Severus was exploded in 1911. It is much to have at hand lists of certainly dated coarse pottery and brooches.

Perhaps the most striking feature of the book is the attempts made at classification, *e.g.* of town houses and country villas, and of standard types of Roman-British brooches. It is all to the good that beginners and others should be helped to a grip of the subject by "recognizable fixed points"; though some of the classifications appear to be simply a convenient *memoria technica*, more or less arbitrary, if useful, guides to the memory. These have some value provided that there is not assumed an evolution from simpler to more complex types without actual proof of a chronological sequence. Where a great amount of detailed knowledge has accumulated, Mr. Collingwood is helpful with his selections of the more important types, *e.g.* of Samian forms and of potters' stamps, though in the latter case those of Aestivus and Condius might have been added as typically Hadrian–Antonine. If the numbered and lettered types here proposed could be brought into general use, we might avoid a vast amount of that unnecessary description and illustration which tend to make reports both expensive and repulsive. Indeed, the author himself exemplifies the difficulty of describing pottery shapes in words, when (p. 224) he writes of bowls "with incurving sides." The locution is misleading as applied to bowls, whose sides, from top to bottom, are at first out-curving from rim to greatest girth, and then in-curving towards the base. If "screw-necked flagons" (p. 228) is admittedly inaccurate, why not "flagons with understepped necks," of 2, 3, or 4 steps? In the list of dated types those numbered 67–70 (p. 233) are of no use for dating, since the so-called "recurved rim," starting with the Claudian period, "reappears in almost every generation." To the notes on certain fabrics (pp. 239–242) might have been added some lines on Rhenish ware of the second century and on the pipe-clay products found in Britain and so well exemplified in the St. Germain Museum. But Mr. Collingwood covers most of the ground, is always lucid in style, and extraordinarily accurate considering the width of his range. If a few slips are pointed out it is in the hope that the book, which should become a standard work of reference, may be made *totus teres atque rotundus*. The dates of the Cissbury earthworks (p. 138) must now be revised in the light of the 1930 excavations of Dr. E. C. Curwen. Apart from the late neolithic flint mines, the ramparts were constructed about 300 B.C. and the enclosed area was occupied till about 50 B.C. After this it went under the plough until the refortification of the camp, with some widening of the ditch and heightening of the ramparts, late in the Roman period (see *Antiquaries Journal*, Jan. 1931).

In order to support his view that Roman villas in Britain are as a rule much smaller than those on the Continent, Mr. Collingwood limits the Folkestone villa (misspelt Folkstone, p. xiii) to block A; but block B, separated from A at one point by only 20 feet, comprises fifteen more rooms and two corridors. If, as seems likely, block B is yet another example of a long wing, the Folkestone villa, with its forty rooms apart from corridors and possible staircase compartments, etc., is quite comparable with Hosti (Belgium) or Nennig (Germany). The measurements of block A, given as "about 180 feet by 81," should be, as shown by the scale supplied, 214 feet by 85. As to the two periods of construction of block A, it is stated, "only the later plan is known." In 'Roman Folkestone' (p. 67) is given a very close approximation to the earlier plan: the finding of the earlier wall foundations of tufa blocks laid on flints and ironstone in the wings, east corridor and rooms west of it, make the plan given almost inevitable. Note also the size of the Darenth (Kent) villa, with an area of 414 feet by 370 feet. The diagram of the Wall (p. 76) does not show clearly the distribution of the four types of wall given in the reference symbols. On p. 77, l. 4 from end, the word "which" is misplaced. The date of the Six Hills, near Stevenage (p. 149), can only be settled, if at all, by digging. Meanwhile it is hardly safe to infer that they are Roman from their position by "what is probably a Roman road"; and colour is lent to the tradition that they are a result of a battle between Saxons and Danes by the names of neighbouring fields, Danes' Blood Field to the west, and Sexborough to the east. S. E. W.

ENGLISH WINDMILLS. Vol. I. (Kent, Surrey, and Sussex.) By M. I. BATTEN, on behalf of the Society for the Protection of Ancient Buildings. *Westminster: The Architectural Press* 1930. 8×5 *inches;* xviii+128 *pages; and illustrations.* 5*s* 6*d*

Our windmills are falling fast. Hence this book, written for the Society for the Protection of Ancient Buildings, is very timely. Any one over fifty who has seen much of the three counties—Kent, Surrey, and Sussex—with which this first volume deals must at some time have noticed that some cherished specimen had ceased to be used; in a few years its battered sweeps (or sails) were falling to pieces; yet a few more, and nothing but the brick foundation or a mound remained. Some few have been turned into residences or tea-houses. It is a story of inevitable decay of a picturesque feature of the English scene. About 1870 there were round Rochester forty active windmills; to-day there is one, at Delce. Competent millwrights have dwindled to half a dozen in the whole country. A fine mill like that at Cranbrook, Kent, earns a precarious profit of a few shillings a year. The classic book for detail on the subject is the 'History of Corn Milling,' by Bennett and Elton (1900). Of this Mr. Batten has availed himself to good purpose in making his useful alphabetical inventory, county by county. We can discover no omissions. The mills are plotted in on sketch-maps, and there are photographs of some seventy of them. Something is said, with the help of Mr. H. P. Vowells, about the origin and development of windmills. At present, about the ultimate origin, *non liquet;* but they seem to have appeared first in England about the twelfth century. The Outwood post mill, Burstow, Surrey, the oldest in England (and still working) dates back to 1665. Ashurst, probably the oldest in Sussex, came to grief in the gale of December 1929; derelict Halnaker, an impressive landmark for those who walk along Stane Street over the South Downs, is in the most lonely position. These three counties had and have more mills than any others in the south of England. S. E. W.

THE BOOK OF THE ICELANDERS (ÍSLENDINGABÓK). By ARI THORGILSSON. Edited and translated with an introductory essay and notes by HALLDÓR HERMANNSSON. *Ithaca, New York: Cornell University Library (London: Humphrey Milford)* 1930. 9×6 *inches;* viii+90 *pages.* $2 (10s)

For vol. 20 of *Islandica* appearing in the year of the Althing millenary Mr. Hermannsson felicitously chose as his subject the Íslendingabók, believed to be the oldest book in the Icelandic language (*c.* 1125). This short—the text only takes a dozen pages—but important document describes the settlement of Iceland (870–930), the founding of the Althing (930), the reform of the calendar, the division of the country into Quarters, the discovery and settlement of Greenland (985), the advent of Christianity to Iceland (1000), and ends with a comparatively long account of the holders of the bishoprics and lawspeakership. Geographically the most interesting statement about Iceland is the historical note that in 870 the country was covered with forests between the mountains and the seashore; presumably these had already largely disappeared by 1125. The little chapter on Greenland is specially important, as it gives the origin of the name, an advertising device of Erik the Red, and mentions the country called Wineland, the first notice in all literature of the American continent, though it is only to remark the identity of the aborigines in the two lands.

An English translation of the Íslendingabók has appeared in print before, namely in Vigfusson's and York Powell's voluminous 'Origines Islandicae' (1905). Ari wrote a matter-of-fact narrative and Mr. Hermannsson has translated it in a matter-of-fact style, eschewing the irritating mannerisms of Morris and, mercifully, his and York Powell's pernicious habit of translating the place-names into English. There are copious notes; and the introductory essay that occupies half the volume contains much of interest on many matters, notably on the settlement of Iceland. Mr. Hermannsson gives the reasons for estimating that one-eighth of the settlers came by way of the British Isles and were responsible for a very considerable admixture of Celtic blood in the Icelandic race. He quotes an intriguing theory that this not only accounts for physical differences between the Icelanders and the Scandinavians but may even supply a reason for the literary talent of the former, their kin in Western Norway not being specially gifted in this respect. J. H. R.

SKÅNES KARTA från mitten av 1500-talet till omkring 1700. Bidrag till en historisk-kartografisk undersökning. By HERMAN RICHTER. (Meddelanden från Lunds Universitets Geografiska Institution: Avhandlingar.) *Lund: Carl Blom* 1929. 10×7 *inches;* xvi+136 *and* 14 *pages; facsimile maps in text and in separate portfolio.*

As the most southerly province of the Scandinavian peninsula and the possessor of several ports on the Baltic and the Sound, Skåne has been from very early times a centre of trade and traffic. With the island of Bornholm, it appeared in all the sixteenth-century Dutch books of sailing directions, although the Hanse League in its prime tried to keep the knowledge of the "East Sea" as far as possible a secret. Dr. Richter shows however that the old sailing-courses for the coast of Skåne were bound to give rise to wrong conceptions of the land configuration, and these had their effect on the early maps, which were constructed on the external, configurative method. Yet the first chart embodying the Baltic sailing-directions —Cornelis Anthoniszoon's *Caerte van Oostlant* (1543)—was a remarkably good map as well as chart, which was largely utilized by Mercator in his map of Europe (1554), and was the basis of several important printed maps.* Mercator however

*See *Geographical Journal*, vol. 70, 1927, pp. 61–67, for an article on the early printed maps of Scandinavia.

introduced a better type of Skåne into his 1554 map, and Dr. Richter regrets, very rightly, that in Mercator's atlas of 1595 this made way for Jorden's inferior Skåne, which Henrik Rantzau sent Mercator, with his own corrections. Though Jorden visited Skåne, he made, the author believes, no proper survey there; and his Skåne is much inferior to his Jutland. Many features of his map of Denmark were adopted, however, by Hondius and Ortelius, and in consequence were widely known and copied for more than a century.

By 1600 there were three types of Skåne in existence—those of Anthoniszoon (1543), Mercator (1554), and Jorden (1590). The author finds little good in the map of Scandinavia by Adrian Veno Aurelius, 1613, pointing out that most of its good features could have been copied from earlier maps. Veno's Skåne is certainly not original. But of his Scandinavia it can be said that where he copied he copied with a discrimination and wisdom that were truly remarkable. Veno is here identified, probably rightly, with Adriaen Veen, the inventor of "gebulte caerten"; but the derivation of "Aurelius" from Orleans (Aurelia) is hardly correct, since Veen was associated with Gouda and Amsterdam all his life. His *Napasser van de Westersche ende Oostersche See-vaert* (1597) shows that he was very familiar with Waghenaer's *Spieghel;* and there are many resemblances between the 1613 map and the chart of Europe in the *Spieghel*.

There were still very few provincial maps, and though maps of the Swedish provinces were made before 1630 by that great cartographer, Anders Bure, Skåne was then part of Denmark. What might have been the first special map of Skåne was planned by the Danish historian Anders Sørensen Vedel, encouraged thereto by Tycho Brahe. In 1589 Vedel, accompanied by one of Brahe's pupils, made an astronomical survey of Skåne, of which Dr. Richter writes a long and very interesting account. But this, like several other great Danish projects chronicled by Dr. Richter, came to nothing. The charts were still superior to the maps except in topography, chiefly no doubt because observations were more easily taken from the sea. The first Swedish chart of the Baltic, Johan Månsson's *Siö-Book* (1644) gave more accurate representations of the coast and configuration of Skåne than even Bure's great map in Hondius' 1635 revision. The type of Skåne on Bure's map was bad because based on no survey. But Dr. Richter does not mention a different version of Bure's map, which showed an even worse Skåne. This was *Tabula exactissima Regnorum Sueciae et Norvegiae . . . terrarumque adjacentium, summo studio ab Andrea Buraeo Sueco in lucem edita . . . Dedicatur . . . Gustavo Adolpho . . . a Nicolao Iohannide Piscatore*, which appeared in Hondius' editions of Mercator of 1633 (German; French *Appendix*) and 1634 (Dutch). It was adopted by Blaeu, appearing in most, if not all, of his later atlases, although Jansson at the same time was publishing the 1635 version in his atlases. All three Scandinavian kingdoms are different on the two versions, Sweden naturally the least. As both versions were first published by Hondius, the earlier was probably a reduced copy of the 1626 original, which the present writer has never seen. But it became much more widely known than the revised version.

Bure's special maps were better than either version of his general map, and Dr. Richter shows that local maps were not fully utilized in composing general maps for another forty years. Indeed, the variety of shapes given to the same district on early local and general maps is astonishing. In 1628 Bure persuaded the Swedish Government to establish an Ordnance Survey. Though at first of little use, this official institution gave Sweden an advantage over Denmark, where national surveying and mapping remained for long in the hands of private patriots like Mejer and Resen.

From 1643 until practically 1679 the Danes and Swedes were fighting for

Skåne. No longer could peaceful scholars and surveyors supply material to Jansson or Blaeu: such maps as were made were practically all for military purposes. Dr. Richter has worked with great industry and judgment through an enormous mass of manuscript and printed material dealing with this period. He has traced the map of Skåne drawn by the Swedish Quartermaster Olof Hansson (Svart) Örnehufwud (better known as Olaus Johannes Gothus, the author of several good maps of Mecklenburg) in 1644 through various forms until its publication, with revisions by the Dane Ivar Vandal and through the agency of Ole Worms, by Jansson in 1646. This was the first printed map of Skåne. Meanwhile the Dane Johannes Mejer made his great survey of Skåne in 1654–58, and drew a large number of valuable local maps, which unfortunately have never been published, and indeed might have been lost to Denmark but for the patriotism of Peder Resen. Dr. Richter has given a detailed and valuable account of Mejer's survey, and added a very useful list of his local maps, together with a reproduction of his map of Skåne. In his general map of Denmark (1650) Mejer had used Örnehufwud's Skåne as printed by Jansson, this being the first time that a special map of Skåne was used in the preparation of a general map. Mejer's own maps of Skåne were in turn utilized by Johannes Husman, the engraver of several maps in Resen's *Atlas Danicus*, in drawing a map of Skåne, Halland, and Blekinge (reproduced) which was published in 1677, and, through the many copies published of it in foreign atlases, became the standard map of Skåne.

In 1684 Gerard Buhrman produced for the Swedish Government the first really reliable map of Skåne (reproduced), which was based on a long and scientific survey. Count Erik Dahlberg had been before him, as he had accompanied the Swedish army on at least one occasion and had included Skåne in a map of Denmark which was published in Pufendorf's *De rebus a Carolo Gustavo gestis*, 1696. But while admitting that Dahlberg was a useful copyist and that he did much by his *Suecia antiqua et hodierna* to make Sweden known to the outer world, Dr. Richter finds little cartographical ability or originality in this or any of his maps. Dahlberg was very industrious, and the author gives a full account of his labours. Buhrman's map unfortunately remained unpublished, and it was not until 1752 that a new map of Skåne, made by Georg Björman for the Swedish Ordnance Survey, was published.

While Dr. Richeter has done a very thorough service to a province which has much historical as well as geographical interest, he has also served the history of the maps of Sweden and Denmark in no small degree by his work among manuscript documents and maps. He has established Olaus Magnus, Anthoniszoon, Mercator, Jorden, Bure, Månsson, Örnehufwud, Mejer, Husman, and Buhrman as the chief original workers in Danish and Swedish cartography. Of the twenty-three maps reproduced, no less than nine have never been printed before. The political and military reasons which, during the seventeenth century, forbade the publication of many Swedish and Danish maps, particularly maps of Skåne, have long disappeared, and it is to be hoped that the rich Dahlberg, Rosenhane, Bagge Wandel, Resen, Mejer, and Sørensen collections will soon be published in full.

E. L.

A HISTORY OF THE VIKINGS. By T. D. KENDRICK. *London: Methuen & Co.* 1930. 9×6 *inches;* xii+412 *pages; illustrations and maps.* 18*s*

The Viking movement has too often been approached from the isolated standpoints of the different countries which experienced its influences, or in brief summaries as an episode in Scandinavian history; even Keary's work left important aspects of the subject outside its scope, and the student has long felt the lack of a general work in any language giving an adequate conspectus of the whole movement in all its ramifications. To fill this gap has been the task which

Mr. Kendrick has set himself, and there can be no question that his object has been fully attained. Indeed, he has given us such good measure that the captious might be inclined to dispute the relevancy of some of the material which he has included. His fourth chapter, for instance, inappropriately headed "Scandinavia in Viking Times," carries the history of the three northern nations from about the end of the tenth century to the Union of Kalmar in 1397; it therefore lies almost wholly outside the period which is implied in the title, and includes the time when Scandinavian maritime supremacy was completely superseded by that of the Hanseatic League. There can be no doubt, on the other hand, that the author has been fully justified in preparing his ground with that careful study of Scandinavian life from prehistoric times in which he has found scope for his own special qualifications as an archaeologist. He rightly insists upon this as a necessary foundation for the proper understanding of that world-shaking expansion which appears to have begun so suddenly and simultaneously in all three countries about the beginning of the ninth century. It is perhaps rather disappointing to find that, after so painstaking a preparation, Mr. Kendrick is not able to arrive at any more satisfactory conclusion as to the causes of the phenomenon than previous investigators of the subject. He refers to all the usual explanations, only to conclude that "neither severally nor together do they seem sufficient to explain migrations so considerable and so long sustained," and that "since there is no solution of the problem the historian must perforce accept the phenomenon of the Viking movement without further questioning, just as the earlier and unexplained movements of the Migration Period are accepted." Those however who are indisposed to let the matter rest there will feel that they are at least provided with a full statement of the historical facts, including a penetrating study of the character and habits of the peoples involved. Incidentally, we are somewhat surprised at the remark that "the sagas have little to say of bows and arrows," when the fate of Gunnar in the Njál Saga and the story of Einar Thambarskelfir at the battle of Svöld immediately leap to the mind. But this is a detail which would not call for remark were it not for the exceptional trustworthiness of the survey as a whole. And, with regard to Mr. Kendrick's acquiescence in the verdict that the causes of the Viking movement are insoluble, it may be pointed out that he is throughout more concerned with facts than with speculation over vexed problems; when these crop up, he is as a rule content to give us a summary of the latest arguments on both sides, without himself attempting to pronounce between them.

The section of the book perhaps most welcome to historians is that devoted to the influence of Sweden upon the early history of Russia, since this is a phase of the subject which has hitherto been rather unaccountably neglected by most of those who have dealt with the Scandinavian expansion. Geographers will be particularly interested in the author's detailed account of the colonial phases of the movement—the settlement of the Faroes, Iceland, and Greenland, and the even more fascinating topic of the Norse discovery of America. Here as elsewhere the book bears convincing evidence of wide and up-to-date reading. It includes a full summary of the results of the recent explorations of Norse graves in Greenland, with illustrations of the clothing so wonderfully preserved in the Museum at Copenhagen, while, in dealing with the American problem, Mr. Kendrick has paid special attention to the late M. M. Mjelde's revolutionary explanation of the passage relating to the length of the shortest day, an interpretation which has been ignored or too lightly dismissed by previous writers on the question. To all students, in fact, who approach any of the varied issues connected with the Viking movement Mr. Kendrick's book will be found to supply a well-nigh indispensable introduction. G. M. G.-H.

CORSICA THE BEAUTIFUL: An Impression of the Island as it is To-Day, and its History. By Major A. RADCLYFFE DUGMORE. *London: Hurst and Blackett*, [N.D.]. 10×6 *inches;* 288 *pages; illustrations and map.* 18*s*

For some years past there has been room for a good general work on Corsica, and for this reason alone Major Radclyffe Dugmore's book is welcome, for it contains just that information which an intending visitor requires, while those who know the island will be glad to renew their acquaintance through its pages. In the first five chapters Major Dugmore takes his reader for a tour of the island, telling them what they may expect to see and how best they may see it. He is a companionable guide and a knowledgeable one, blending description aptly with anecdote and historical reference. He does not attempt to describe one of Corsica's chief glories—the flowers—since others have dealt with the subject, notably Miss D. Archer in 'Corsica, the Scented Isle.' This is not true of the bird life of the island, which has been neglected by previous writers, but Major Dugmore frankly admits that the two seasons he spent in Corsica do not entitle him to tackle the subject, although he rightly deplores the inadequate protection given to bird life. The last three chapters of the book are devoted to an outline of the island's history from earliest times until the British evacuation in 1796. The book concludes with some hints on trout-fishing and suggestions to painters, followed by a useful appendix containing a list of places of interest, with brief notes. There is a map and an index, and the photographs are of that high standard which Major Dugmore's readers have learnt to expect from him; they are fairly representative of the whole island, although it is surprising not to find one of the famous Calanches. Another surprising point about the book is that the author has not seen fit to bring it up to date; the introduction is dated August 1927, so that when he speaks of "the prices last winter" he must be taken as referring to three years ago. And now that the authorities are laying themselves out to attract the tourist, Corsica is changing—all too fast. O. R.

LA FRANCE IGNORÉE. By E. A. MARTEL. (Tome II. Des Ardennes aux Pyrénées.) Nord-Ouest—Centre—Causses et Pyrénées. *Paris: Librairie Delagrave* 1930. 11×9 *inches;* 306 *pages; illustrations and maps.* 80 *fr.* (95 *fr. bound*)

This is the second volume of a work dealing chiefly with the subterranean phenomena of France—grottoes, caves, canyons, underground rivers, *pertes*, *avens*, and so forth, but with occasional excursions into the realm of dolmens, menhirs, and prehistoric art. The book ends with a chapter on coast erosion. France, owing to the very wide distribution of limestone rocks of all ages from Cambrian to Tertiary, is peculiarly rich in examples of subterranean erosion and rock solution and deposition, as the four hundred interesting illustrations of this book amply testify. The author describes these features in the present volume in the north-west, central, and south-west of France, from the Ardennes to the Pyrenees. Full reference is made to other works dealing with the same subject, and where such work is comprehensive, as in the instance of the Causses and of the Tarn Gorge, M. Martel has contented himself with short comments on the previously published work to which he adds photographs and plans. The book will be a valuable addition to the geographical reference library, all the more so as it contains a full alphabetical index. H. O.

ETRURIA PAST AND PRESENT. By M. A. JOHNSTONE. *London: Methuen & Co.* 1930. 8×5 *inches;* xvi+246 *pages; illustrations and maps.* 7*s* 6*d*

This book, produced under the influence of the University for Foreigners at Perugia and owing much to the inspiration of the 'Etruria antica' of Professor Pericle Ducati of Bologna, is intended for the general reader and for the inquiring

traveller. It gives a charmingly enthusiastic but simple account of Etruria and the Etruscans, with special emphasis on their social history. Visitors to the Museo Archeologico at Florence, the Gregorian Museum in the Vatican, and the Villa Giulia at Rome, with their rich Etruscan collections, and indeed to many other similar museums, must have often felt the need of some such general exposition. Terracottas, bronze statues and cauldrons, bucchero pottery, ivories, gold jewellery, reproductions of temples and tombs, frescoed walls—all these and much else in plenty are apt to bewilder the unprepared stranger: the museums themselves offer little help. Della Seta's guide to the Museo di Villa Giulia (1918) is too detailed for such a purpose, was (in 1921) too expensive (30 lire), and printed on bad paper; Milani's guide for Florence (1902) was better. But of course both are in Italian. It is some satisfaction to think that so much of the good work on Etruscology has been done by British scholars. Sir Thos Dempster, a Scot, was the *fons et origo* of the science; the solid work of George Dennis, of mid-nineteenth century, carried on worthily; and recently we have had Mr. Randall-MacIvers' three books. In the museums themselves one feels that they would be better for English interpretation. Mr. Johnstone, who has a pleasantly imaginative style, is a practical guide, ready with the right kind of hints as to how to find the antiquities. Eight centuries of graves are the national monument of Etruria. In the necropolis of Tarquinia, with its amazing paintings, we see "how the Tarquinian dressed and danced and feasted; the luxury of his jewels, elegant furniture, wines, and slaves; his love of the open air; his circus; his hunting dogs and his hunting leopards, the wild boars which he hunted." Table forks, not used by the Romans, were used in Etruscan Marzabotto; Etruscan dentistry included the binding of teeth with gold. Knowledge will increase as the tumuli of Caere (Cervetri) are gradually opened up with modern system. It is with lively interest we note how often the tomb pictures contain the germs of what we know as Roman, *e.g.* of the toga, and how the grave materials prove a well-marked sequence in trading connections, first Cypro-Phenician and Egyptian, and later with Ionic and Attic ports. The terracotta Apollo found in 1916 near Veii, and interpreted by Professor Giglioli—a specimen of genuine Etruscan realism—was indeed an eye-opener. What skill was required to fire this big statue! Mr. Johnstone concludes with a suggestive chapter on Etruria and Rome. S. E. W.

AN ITALIAN HOLIDAY. By PAUL WILSTACH. *London: Harper and Brothers* [N.D.]. 9×6 *inches;* 382 *pages; illustrations and sketch-map.* 12*s* 6*d*

Mr. Wilstach does not rise above mediocrity as a travel-writer. His long-winded, wordy, jog-trot pages fail altogether to hold the reader, notably in a chapter such as that on Rome. Yet he has undoubtedly had opportunities in going off the beaten track which do not fall to the lot of the ordinary tourist, as in his visit to the Trulli in the neighbourhood of Taranto. He is at great pains to take us to the room where the Duce was born, escorts us to the Verdi district, and follows the career of Caruso. He covers most of the peninsula, some of his more interesting pages being devoted to a description of the manufacture of Parmesan cheese. The photographs are numerous and good. L. C.-M.

THE BALKAN ROAD. By ARCHIBALD LYALL. *London: Methuen & Co.* 1930. 9×6 *inches;* viii+244 *pages; illustrations and sketch-maps.* 12*s* 6*d*

This book is in no sense strictly geographical, but it is none the less of interest to travellers. The author, who says that he is not in a position to instruct his readers, moved from place to place by car, by air, by train, and by sea. He visited countless cities, of which we hear a great deal, he often left the beaten track, he

had eyes to see, and he has the capacity to describe very vividly the many things of interest with which he was brought into contact. He went to Constantinople, apparently a little more than two years ago, by way of Germany, Czechoslovakia, Hungary, Romania, and Bulgaria, and came back through Greece, Albania, and Yugoslavia, and on his travels secured a good idea of things as they are at the present day in Central Europe and the Balkans. Poland is one of the few religious countries left in Europe, in Bucharest dainty beauties in Paris fashions jostle barefooted poor women, and, whether seen from Pera, from Asia, or from the deck of a steamer, no change of dress or habits can spoil the ethereal beauty of Istanbul.

The author has much that is interesting to say about the conditions prevailing in Albania, in pre-war Montenegro, and in Dalmatia, and here it is clear that he sees many of the difficulties of the present situation. The book is well illustrated, has a sketch-map showing the author's route, and its utility is increased by an adequate index and by an appendix, containing, among other things, a list of places called by different names in Serbo-Croatian and Italian. H. C. W.

AGRICULTURAL RUSSIA ON THE EVE OF THE REVOLUTION. By GEORGE H. PAVLOVSKY. *London: George Routledge & Sons* 1930. 9×6 *inches;* x+340 *pages; and maps.* 15*s*

In this book Dr. Pavlovsky sets forth the condition of agricultural Russia just before the Revolution, as surveyed against its historical background. Its theme is treated primarily from an historical and economic rather than a geographical point of view. To the geographer the main interest lies in the brief but adequate summary of the natural conditions, the economic and historical influences, and the agricultural regions as described in Part I.

In Part II the author discusses the organization and conditions of farming in pre-war Russia, with special reference to the Emancipation of the Peasants, their land-hunger, and the subsequent agrarian reforms. Although recognizing the great evils that afflicted Russian peasants right up to the outbreak of the World War, the author suggests that there was already then discernible an upward trend. He sees signs of better farming and marketing methods, and suggests (more by implication than by definite statement) that he considers that a great improvement in agricultural conditions in Russia would have taken place had there been neither war nor revolution. One cannot tell. It is useful to see the reverse of this picture in L. Trotsky's Life of himself, in which one gets a far gloomier vision of pre-war Russia.

Part III consists of a description of Russia's agricultural production, a very useful section, but belonging to a past which is completely divorced from the present.

The book is amply supplied with statistics and they are fully discussed by the author, who keeps carefully in mind the dangers of drawing conclusions from statistics of any kind and especially from those of pre-war Russia. There are three maps and an index. There is no bibliography, but there are many footnotes referring to books in Russian, English, and German. Frequent mistakes in tense sequence are a minor but irritating defect in an otherwise well-written and carefully thought out book. A. B.

TURKEY: YESTERDAY, TO-DAY AND TO-MORROW. By Sir TELFORD WAUGH. *London: Chapman & Hall* 1930. 9×6 *inches;* xii+306 *pages; illustrations and sketch-maps.* 18*s*

Sir Telford Waugh's knowledge of Turkey was gained during forty-four years' experience in the Consular service. He has undertaken a difficult task in attempting to deal, in one small volume, with so broad a subject as Turkey: Yesterday,

To-day and To-morrow. There is even a chapter on the Days before Yesterday—a short historical sketch of the history of the Turks from the legend of the Grey Wolf to the Tangimat reforms by virtue of which Turkey obtained admission to the family of European nations. From 1885 the book is a record of the author's own impressions and experiences, covering the work of no less than eight British Ambassadors. A chapter is devoted to an excellent translation of the Ghazi's speech, delivered before the Grand National Assembly at Ankara in October 1927.

Many volumes of reminiscences fail to hold one's interest because they lack a definite purpose: Sir Telford Waugh has provided a clear-cut study of the Turkish national character, depicting with the utmost fairness its strength and its weakness, recording the battles of the reformers against idleness, procrastination, and corruption. His views on Turkey's economic prosperity are pessimistic. He considers that the policy of "Turkey for the Turks" has been carried too far; but the Nationalist Government will get its bearings in time and steer the right course, and the Turk is tired of sailing before the mast. Having helped to steer his country into a comparatively safe harbour he feels that he should share the profits of the voyage.

Sir Telford Waugh closes with the quotation, "Maintenant je ne prognostique plus." That is regrettable. We would have enjoyed going on with him into the future of Turkey as he imagines it will be. S. M. E. F.

DURCH TIBET UND TURKISTAN. By WALTER BOSSHARD. *Stuttgart: Strecker und Schröder* 1930. 9×6 *inches;* xiv+246 *pages; illustrations and maps. Bound M.*12

This is a very readable account of a two-years' journey by the author who, landing at Karachi and making his way by Srinagar to Leh, passed thence by an unusual route to Kashgar, where he spent a considerable time, returning home eventually through Tashkent and Moscow. The journey, except the return to Europe, was made in company with Dr. Emil Trinkler (see *G.J.*, 75, 1930, pp. 505–517). The title of the book, it may be said at the outset, is a little misleading. Unless we are to know Ladakh by its archaic term of Little Tibet, the writer's journey barely took him within Tibetan limits when he crossed out of the Chang Chenmo on to the Lingzithang plateau in his traverse to the Aksai Chin. With this much qualification however it is fair to say that the book is remarkable; and, if it has not already received it, badly in need of translation to make it accessible to a wider public. The author's observations in Ladakh are those of an intelligent traveller; but it is not easy to forgive him for compressing into two pages the details of the organization of the caravan of 108 beasts and their loads; and what must have been an adventure in bringing them from Leh over two 18,000-foot passes, through the Chang Chenmo and out on to the Lingzithang plains. Much of the detailed and picturesque account of the appearance and customs of the Ladakhis might have been spared, to give the space saved to what would, in "bundobust," have been of far greater interest to readers who have tried to solve the same problem.

The usual trouble about drinkable water was first acutely felt in the Aksai Chin; while the unwise habit of long marches and short grazing played havoc with the yaks of the party till reduced to a single survivor. The ponies, as usual, stood up to the work better. The author made an unusual traverse from the Aksai Chin lake to rejoin the Leh trade route at Shahidulla, thereby short-circuiting both the Karakoram Pass and the Shyok crossing; whence, on to Kashgar, his route follows known landmarks. During a prolonged stay at Kashgar he has a great deal that is recent and interesting to record. His archaeological side-expedition to the Buddhist stupa at Rawak, and to the ruins of Dandan

Oilik in the Taklamakan, and his subsequent expedition to Bostan Terek are recorded with a high degree of intelligence, and are accompanied by commentary showing an intimate knowledge of his subject.

We may note the author's commendable habit of inserting at frequent intervals clearly expressed maps giving the itinerary, instead of dragging the reader, in the usual maddening way, to a folded map at the end; also the high artistic value of the photographs. A good index and two quite impressive panoramic views of the Kunlun close a thoroughly readable book. L. A. B.

SOCIAL ORGANIZATION OF THE NORTHERN TUNGUS: With introductory chapters concerning geographical distribution and history of these groups. By S. M. SHIROKOGOROFF. *Shanghai: The Commercial Press* 1929. 11×8 *inches;* xiv+428 *pages.* $10.00 [*Shanghai*]

This very complete work on certain aspects of Tungus life will be specially useful to students of man's social organization. The author has however been at pains to investigate and describe the geographical surroundings under which the Tungus live and to show how they have adapted themselves to these surroundings. The present geographical distribution of the various clans is carefully detailed and also the lines of their probable migrations; the latter however are at present not fully understood, and the author's conclusions must be read very critically. It is somewhat unfortunate that in a book of this size the author has not had the assistance of an experienced English writer; while one cannot but congratulate him on his mastery of our tongue, his style is very diffuse, and the present reviewer at least often found it difficult to grasp the meaning. Still the facts are there, although one may have considerable difficulty in digging them out, and they are separated from the author's theories, from which many will probably differ. The indices are excellent; the maps might have been redrawn with advantage. Books in English on the Northern Asiatic tribes are rare, and this is a welcome addition to them, but we cannot help feeling that all could have been said much better in little more than half the space allotted to it.

L. H. D. B.

EUROPEAN ADVENTURERS OF NORTHERN INDIA, 1785 to 1849. By C. GREY. Edited by H. L. O. GARRETT, Keeper of the Records of the Punjab. *Lahore: Superintendent, Government Printing* 1929. 10×6 *inches;* 362+lxviii *pages; and illustrations.* 16*s* 6*d* (*Rs.*10)

There is no more romantic chapter in the military history of India than that which deals with the soldiers of fortune who, in the century following Plassey, took service with the Indian princes and organized their soldiery on European lines. They were of many nationalities and of all classes, from deserting British privates or sailors to distinguished French officers who had served under Napoleon; and there was no less diversity in their characters and in their fates. Many met with a violent death or were finally expelled with ignominy; while a fortunate few realized large fortunes and returned to Europe to enjoy them. Nearly all lived a life of insecurity and experienced striking vicissitudes.

Some forty years ago Mr. Herbert Compton published 'European Military Adventurers of Hindustan, 1784–1803,' in which the subject was dealt with in considerable detail and with much literary skill. This is now supplemented, though not superseded, by the work under review, which not only brings the story down to a much later date, but concerns itself very little with most of the adventurers mentioned by Compton, confining its attention almost entirely to the careers of those who served in the Punjab, chiefly under Ranjit Singh. Of these it gives a full account, based mainly upon six years' careful research in the Lahore

archives. The careers of over seventy adventurers—the majority of them hitherto unknown—are traced in detail. Non-combatants are included, and one of the most interesting chapters tells of the wanderings of Charles Masson, "traveller, geographer, archaeologist, numismatist." At least one established reputation—that of Alexander Gardiner (or Gardner)—emerges from the scrutiny in rather a damaged condition. A feature of special value from the geographical point of view is the itinerary of a journey made in 1826 from Persia to Kabul by Claude Auguste Court, now published for the first time.

The volume is open to criticism as regards the method of presentation. There is no map; the illustrations are poor, and bear no indication of their sources; while Mr. Grey's style, though it has a rough vigour not altogether out of keeping with the subject, is lacking in distinction. These however are minor drawbacks, and the wealth of new information brought to light from unimpeachable sources, no less than the interest of the subject itself, will ensure the work a warm welcome.

W. F.

A MERCHANT VENTURER AMONG THE SEA GIPSIES: being a Pioneer's account of life on an island in the Mergui Archipelago. By LEOPOLD AINSWORTH. *London: Nisbet & Co.* 1930. 9×6 *inches;* xii+280 *pages; illustrations and sketch-map.* 15*s*

Those who are interested in the characteristics and curious mode of life adopted by the Mawken of the Mergui Archipelago will find this book a useful complement to W. G. White's 'Sea-Gypsies of Malaya,' published in 1922. Mr. Ainsworth does not profess to write as an anthropologist, but during a sojourn on Casuarina Island, where he started a timber supply business single-handed, he had the advantage of daily contact with a number of the Mawken, whom he had induced to fell trees for him. Since he is a shrewd observer, with a knack of setting down his experiences and the results of his observations in readable form, he is able to tell us a great deal about these strange people who, like the Bajaus and Orang Pelahu of the Borneo seas, seldom leave their boats and get their living from the produce of the sea, having been driven to this wandering existence first by the fierce hill tribes on the mainland and then by the Malay pirates. In Mr. Ainsworth's account of the Mawken there is much serious first-hand information which anthropologists will be glad to have; but there is even more in the book that will interest the ordinary reader. For this is a personal narrative of endeavour in a little-known part of the world, the account of a man's single-handed struggle to carry out an enterprise in the face of adversity: one of the oldest stories in the world, of perennial interest, and Mr. Ainsworth tells his version of it with such good humour and modesty, yet with such a wealth of unusual incident, that it makes absorbing reading.

O. R.

THE PIRATE WIND: Tales of the Sea Robbers of Malaya. By OWEN RUTTER. *London: Hutchinson & Co.* 1930. 9×6 *inches;* 292 *pages; illustrations and map.* 12*s* 6*d*

With considerable local knowledge of Malaya, aided by imagination and an easy-flowing pen, this versatile author has welded incidents gathered from old public records and books long out of print into an exciting story of the pirates of the East Indian Archipelago and the operations that resulted in their suppression. It is good to meet again the ferocious Malay swashbuckler with his red coat covering chain mail and his armament of strange lethal weapons, prancing on the deck of his swift-flying prahu and playing hide-and-seek amongst the Islands with the cheerful British sailor, for the edification of the boyhood of to-day and to remind an earlier generation of thrills and spasms induced by the tales of the

late G. A. Henty and his like. And it is good to read the exploits of the pirate-hunters, Keppel, Brooke, Belcher, the unaccountable Wyndham, and other heroes of the sort, in times when our Empire was still building and the hoisting of the Union Jack on some new territory all in the day's work of the British Naval Commander.

The origin, or rather the development, of piracy in the Archipelago is attributed in part to an insatiable desire for revenge aroused in the island peoples by the cruelties practised on them by early European traders and also, somewhat paradoxically, to the business of satisfying the strong demand for slaves, male and female, but principally female, amongst the Dutch settlers in Java. The work is skilfully constructed. After descriptions of the *mise-en-scene* and of the nature and methods of the pirates, the feelings of the reader are brought by selected samples of the bloodthirsty sea-rover business to a proper condition for appreciation of the rootings out of strongholds and the scatterings of piratical fleets that form the chief contents of the book. There are many points of commanding interest, amongst them the romance of the White Rajas of Sarawak which can never lose its fascination, the adventure of Captain Ross, and the raiding of Balambangan which is well and convincingly told. The author's etymology of the word "Balambangan," by the way, is doubtful. It seems more likely to have come from Belumbang-an, "place of waves," than from Belum-bangun, "not yet risen."

The appearance and form of the book are good. The numerous pictures, reproduced from prints nearly a century old, are very interesting. The type is clear and contains few errors, an adequate map adorns the end papers, and there is a sufficient index. Altogether a satisfactory piece of work, of historical interest and value, and an excellent gift book for a boy. Why the publishers enter it in their lists as a "Travel" book does not readily appear. W. A. G.

MON VOYAGE AU SOUDAN–TCHADIEN. By Abou Digu'en. *Paris: Pierre Roger* [N.D.]. 8 × 6 *inches;* 296 *pages; illustrations and map.*

This book is an account of the author's travels as a semi-itinerant trader in the country round Lake Chad. He first settled in Mandara where he married a Fulani woman. His commercial activities excited the jealousy of the Greeks and Syrians from Kano, who largely control the Chad trade, and their hostility eventually forced him to move into Kanem. From there he crossed the frontier and travelled through Nigeria to the coast. Shortly after his arrival in British territory he got himself into trouble with the authorities at Kano, against whom he makes fantastic allegations. E. W. B.

NICOLL'S BIRDS OF EGYPT. By Colonel R. Meinertzhagen. 2 vols. (Published under the authority of the Egyptian Government.) *London: Hugh Rees* 1930. 13 × 10 *inches;* xvi + 698 *pages; illustrations and maps.* 30*s*

It is nearly sixty years since Captain G. E. Shelley's 'Birds of Egypt' appeared, and since then much work has been accomplished and great advances have been made in our knowledge of this subject. Michael Nicoll, who originally planned and prepared part of the present work before his untimely death in 1925, was for nearly twenty years Assistant Director of the Zoological Gardens at Giza, near Cairo. All his leisure time during his service in Egypt was spent travelling about the country collecting and observing the abundant bird life in the desert and the cultivated areas, and although he had published, as a preliminary measure, in 1919 a 'Hand List of the Birds of Egypt,' he was not destined, through the break-down in his health, to accomplish the greater task. After his death Mrs. Nicoll asked Colonel Meinertzhagen to undertake the completion of the work, and the

Egyptian Government agreed that it should be accomplished, and undertook to be responsible for the expenses of publication.

The greater part of the two volumes is occupied with the systematic list of the birds found within the limits of the Kingdom of Egypt, which, it must be remembered, includes not only the Delta and the Nile Valley, beyond which most visitors to Egypt rarely stray, but also the vast eastern and western deserts and the Peninsula of Sinai, where many of the rarer and less-known species occur. The systematic portion of the work is, so far as we can judge, accurate and excellently carried out, with all the information necessary for the identification of any species which one is likely to come across.

Perhaps the most interesting portion of the work to readers of this *Journal* will be the four introductory chapters. The first of these deals with the physical geography and geology of Egypt, and contains an account of the evolution of the desert and the Nile Valley from late Eocene times. In his description of the desert Colonel Meinertzhagen grows quite lyrical. "The attraction of the Desert is that of woman for man. It is when she is silent that she is most attractive, most elusive, most seductive. It is when she is boisterous that one hates her most. Life with her is one continual dream of romance, for she has the power of making the traveller feel he is her sole admirer, her lonely visitor." Apart from the pluvial periods which corresponded with the glacial period of Northern Europe, Colonel Meinertzhagen believes that even during historic times the evidence is quite conclusive that conditions were not so severe as they are at the present time and that the deserts enjoyed a greater rainfall and a more profuse and varied flora and fauna than they do to-day.

Two chapters, one on migration and another on the birds of the ancient monuments, are by Mr. R. E. Moreau. In the first of these it is pointed out that although the Nile Valley is undoubtedly one of the most important migration routes in the world, no birds from Western Europe use this route, and that out of the thousands of migrating birds which have been ringed of late years in the British Islands and on the Continent and recovered, hardly one has been captured in Egypt. Another fact which is made clear is that although the Nile Valley is the most important line of migration there is a great deal of migration across the desert from north to south, as evidenced by observations recently made in the oases, especially in the western area.

A word must be said in regard to the coloured plates and other illustrations, which are very numerous and of high quality. The coloured plates are by Mr. G. E. Lodge, Mr. Roland Green, and Mr. Grönwold, and there are numerous black and white sketches in the text, most useful for assisting in the identification of the birds. We heartily congratulate Colonel Meinertzhagen on having given us not only a thoroughly up-to-date account of the birds of Egypt, but two most attractive volumes which will be a lasting memorial to his old friend and companion, Michael Nicoll. W. L. S.

AU COEUR DE L'AFRIQUE. OUGANDA: un demi-siècle d'Apostolat au centre africain. 1878–1928. By R.P. ANTONY PHILIPPE (des Pères Blancs). *Paris: Dillen & Cie.* (1929). 10 × 7 *inches;* 192 *pages; illustrations and map.* 20 *fr.*

The above work is a history of the foundation of the Mission of the White Fathers in Uganda and the progress of their work during the last fifty years. It is a remarkable story of persistent effort, and in the early days the obstacles for a long period were such as would have caused most men to despair. It is evident that only their religious fervour carried them through; many a time their lives must have hung on a thread.

For a history of this nature to be in true perspective it should be written by a

layman unprejudiced by interest in the work but with full access to the archives. As it is however, the value of the record is somewhat vitiated by a tinge of bitter comment regarding many of the incidents of bygone days when the rivalry between the Catholic and Protestant missionaries in Uganda was so intense. The alleged treacherous behaviour of that famous pioneer missionary Mackay will probably not be allowed to go unchallenged. The reverend father's version of the actions of Jackson, Lugard, Williams, etc., moreover is, it is believed, not always according to fact. It is, for instance, stated that the Imperial British East African Company demanded the monopoly of trade in Uganda; this is quite incorrect, for at no time did that body ever arrogate to itself such a monopoly. There is little doubt that if from the time the Chartered Company opened up relations, the White Fathers had taken a longer view and tendered wiser counsel to that shifty creature Mwanga, much bloodshed would have been avoided. Their dream of supporting Mwanga in the policy of maintaining an independent kingdom in Central Africa with the White Fathers moulding its policy was, even then, felt to be a chimaera.

There is however no desire to disinter these old antagonisms, for most of the protagonists have now passed away, and it must be admitted that the work is a record of an amazing achievement. It is further hoped that the Ba-Ganda are duly grateful for all the self-sacrifice which has been devoted to their spiritual and physical welfare. C. W. H.

THE DINOSAUR IN EAST AFRICA: An account of the giant reptile beds of Tendaguru, Tanganyika Territory. By J. PARKINSON. *London: H. F. and G. Witherby* 1930. 9×6 *inches;* 192 *pages; illustrations and sketch-maps.* 12*s* 6*d*

Bones of dinosaurs were first observed at Tendaguru Hill about 70 miles west of Lindi in 1907. The spot was first investigated by the late Professor E. Fraas, who collected and described a small series of well-preserved bones now in the Stuttgart Museum. Through his influence a special committee was set up which collected from private and Government sources the large sum of money, nearly £12,000, necessary to keep a well-staffed and equipped expedition in the field for four seasons. This expedition made the magnificent collection now in Berlin. Preparation of this material has proceeded ever since, and a series of monographs dealing with the geology and invertebrate palaeontology of the region, as well as the structure of the dinosaurs themselves, have already appeared, to be followed by others in the future.

At the end of the War, when Tendaguru passed into British control, the British Museum was urged to continue collecting in the area in the hope that they could there obtain, relatively easily, material of sauropodous and other dinosaurs which would in any case be useful additions to their collections and might add new parts to those already known. Dr. Parkinson was for one season in charge of these excavations, and in the book under review gives an account of the general character of the terrain, of some of the excavations which were here made for the collection of fossil bones, and in a popular way of the geology. The book also includes a short general account of the classification of the dinosaurs, with a few figures, mainly from the American Museum of Natural History. It closes with an account of the discoveries of dinosaurs in other African localities.

D. M. S. W.

BIG GAME HUNTING IN CENTRAL AFRICA. By W. BUCKLEY. *London: Cecil Palmer* 1930. 9×6 *inches;* viii+268 *pages; and illustrations.* 10*s* 6*d*

Mr. Buckley's interesting Central African reminiscences as an ivory hunter take the reader back to the beginning of the century when the vast open spaces carried enormous herds of game, and when a dozen elephants were shot down in a

morning for their ivory. In his first chapter the author mentions encountering a herd of elephants two thousand strong on the banks of the Upper Nile in that portion of the Bahr el Ghazal then known as the Lado Enclave, a small strip of bush country held on lease by the Belgians for the duration of the life of King Leopold II, and taken over by the Anglo-Egyptian Sudan in 1912. During the two years elapsing between King Leopold's death and the taking over of the Lado area by the Sudan Administration this territory was a sort of no man's land, and attracted a large number of ivory hunters who "shot out" this particular herd and netted profits in some instances of £5000 or more. This well-known herd, or concentration of herds, had a range of 500 or 600 miles, going as far north-westward as Darfur, and concentrating during the dry season upon the Nile round about Lado and the old Belgian post of Kiro. Practically all the elephants in the Bahr el Ghazal collected in those days in the Lado Enclave during the hot dry season when the smaller streams and water-holes elsewhere were dry. In spite of the almost complete extermination of the bulls carrying saleable ivory during those two cruel years, this herd, when encountered by the reviewer in 1922 on its way from the Nile, although broken up into detachments, was fully 1500 strong. To-day, owing to the extension of cultivation, prospecting, etc., and the facility with which high-powered rifles are obtainable by the natives, the annual concentration on the Nile is a comparatively small affair; but the total number of beasts nevertheless is probably but little diminished, though the females now far outnumber the males.

Mention is rarely made of dates and places in this book, but one gathers that Mr. Buckley roamed far and wide for years taking toll of other large herds which had their well-recognized range of country. Only the first half of the book contains hunting reminiscences, the remainder being very readable personal recollections of the Matabele rebellion, the Kimberley diamond fields, the Jameson Raid, the second Matabele rising, and other stirring items of South African history. C. C.

PLANTS OF THE GOLD COAST. By F. R. IRVINE. *Oxford University Press* 1930. 8×5 *inches;* lxxx+522 *pages; and illustrations.* 5*s*

This is hardly a work which will form part of the equipment of the occasional traveller to the Gold Coast. The new and unfamiliar script of the International Institute of African Languages and Cultures, in which the native names are recorded, renders it essentially a work of reference for the African—which is the author's object—or for the resident in the country who has some opportunity to become familiar with the local languages. The book is concerned with the plants, native and introduced, of the Gold Coast Colony and Ashanti. The author is Master of Agriculture and Biology at Achimota College, and his first interest is research into the native languages and their bearing on plant lore. In this respect he has placed on record a mass of information which must otherwise have been lost through the changing conditions of European methods of education and their effect on the tribal customs.

The author's record of his observations in this respect is set out in the Introduction and dispersed through the pages of the enumeration of plants which occupies the bulk of the book. This is the most valuable contribution made to our knowledge. There are various lists of Economic Plants grouped according to their uses, and lists of equivalents of native names according to their languages. The general arrangement of the enumeration is alphabetical according to the botanical names of the plants. The book however does not provide any means of assisting to identify plants other than through their native names, generally a doubtful procedure from a strictly botanical point of view, but quite useful for popular requirements. T. F. C.

VANCOUVER: a life, 1757–1798. By GEORGE GODWIN. *London: Philip Allan* 1930. 9×6 *inches;* xii+308 *pages; illustrations and map.* 15*s*

A SPANISH VOYAGE TO VANCOUVER AND THE NORTH-WEST COAST OF AMERICA 1792. Translated with an introduction by CECIL JANE. *London: Argonaut Press* 1930. 10×8 *inches;* xiv+142 *pages; illustrations and map.* 24*s*

In the publishers' words, "we have had to wait a long time for a life of Captain Vancouver," and, without disparaging Mr. Godwin's work, the reason for this is plain. The outstanding achievement of Vancouver's life was his survey of the western coast of North America during the years 1791–5, and a very full account of this is to be found in his own narrative, 'Voyage of Discovery to the North Pacific Ocean . . . principally with a view to ascertain the existence of any navigable communication between the North Pacific and North Atlantic Oceans,' published posthumously in 1799. When it is recorded that he took part in Cook's second and third voyages, it will be seen that there was room for few further incidents in a career that was cut short in his fortieth year, apart from a largely uneventful period of service in the West Indies. Mr. Godwin wisely realizes that it is the Vancouver of 1791–5 that is the great figure, and devotes most of his pages to those years, sketching the course of Cook's two voyages only to show the school in which the man was made. Few men can have modelled themselves so consciously upon another as Vancouver did upon Cook, and he clearly regarded his voyage to the Northern Pacific as the completion of Cook's work, and therefore necessarily demanding the same high standard.

His expedition had two objects, the carrying out of the settlement of the Nootka Sound controversy between England and Spain, and a thorough survey of the north-west coast of North America to solve the problem of the disputed North-West Passage *via* the Strait of Anian, or de Fuca. Vancouver's surveys successfully disposed of the possibility of such a strait existing, but, through no fault of his own, he was unable to discharge the first duty. Spain had undertaken to restore the settlement occupied by Meares in Nootka Sound, but on arriving there Vancouver found its extent to be so exiguous that he could not bring himself to believe he had been sent from the other side of the world to assert such a claim. He did not fully realize that the question at issue was the right of Spain to control all navigation and commerce in those waters: when once that claim was abandoned, questions of territorial rights were for the moment of minor conse quence. In fact, the outbreak of the Revolutionary Wars threw the whole affair into the shade. He and the Spanish officer, Bodega y Quadra, mutually agreed to maintain their positions until further negotiations were concluded at home.

Mr. Godwin has collected the scanty details of Vancouver's family and private life, and prints in the appendix his correspondence with the authorities at home. The bibliography shows signs of hasty compilation, and the present resting-place of the various logs and other documents might have been noted. Incidentally, Edgar's log does not make it absolutely clear that Vancouver was present when Captain Cook was killed. The mêlée, in which he was involved according to Edgar, occurred on the day previous to Cook's death.

When Vancouver was examining the waters between Vancouver Island and the mainland, he encountered two Spanish vessels bound upon the same mission. The latest publication in the Argonaut Press Series is an account of the voyage of these vessels, the *Sutil* and *Mexicana*, translated for the first time by Mr. Jane. Vancouver describes them as "the most ill-calculated and unfit vessels that could possibly be imagined for such an expedition": nevertheless they carried out their task, and were only beaten by their English rivals in the circumnavigation of Vancouver Island by a few days. The two expeditions cooperated as far as pos-

sible, and the Spanish account contains some interesting sidelights on Vancouver. The man is well summed up in the following quotation: "Mr. Vancouver however replied that while he had always the most complete confidence in our work, he did not feel himself to be free from the responsibility *if he did not see everything for himself* since it was expressly laid down in his instructions that he was to explore all the channels along the coast from 45° to Cook River." In spite of his thoroughness, it is remarkable that Vancouver failed to recognize and explore the mouths of the two great rivers Columbia and Fraser. The Spaniards likewise failed to discern the latter, though they mentioned to Vancouver a reported river in this neighbourhood, to which the name of Florida Blanca had been given. This may well have been the Fraser. When off its mouth they were driven out to sea by the force of its discharge, but this and other signs of its existence were not read aright.

This Spanish account gives the Nootka controversy from the other side, and contains valuable ethnographical material. Mr. Jane in his introduction is perhaps inclined to emphasize too strongly the scientific disinterestedness of the Spanish, as compared with the other voyagers: after all, Spain had attempted to maintain a commercial monopoly, and had failed through lack of national power, and no contemporary work had the high scientific value of Vancouver's. Further, he does not make it plain that, in demonstrating the "unreality of the alleged strait," the Spaniards must yield precedence to Vancouver. This Spanish account, first printed by Navarete, is anonymous: curiously enough, Mr. Godwin attributes it to one Espinosa y Tello, who is not mentioned in the Argonaut book. Though overshadowed by Vancouver's exploits, the work done absolves the Spaniards from the charge of entirely neglecting the scientific examination of their Pacific possessions. G. R. C.

BRISTOL, RHODE ISLAND: a town biography. By M. A. DE WOLFE HOWE. *Cambridge, Mass.: At the Harvard University Press* 1930. 7×6 *inches;* 174 *pages; and illustrations.* $2.50

This book will disappoint the geographer. Unreasonably however, for it certainly was not written for him. The author calls it a Town Biography and there is nothing new to the geographer in the concept of a town as a living organism, intimately associated with, and influenced by, its environment; but of all this the book contains nothing. The characteristics of the town are developed around some representative characters; but so much is there of the allusive in the methods of the author, so little of constructive, connected description, that the reader sees neither Bristol in evolution nor, very clearly, those Bristol worthies with whom the work is so largely concerned. Ll. R. J.

INDIANS AND PIONEERS: the story of the American south-west before 1830. By GRANT FOREMAN. *New Haven: Yale University Press* (*London: Humphrey Milford*) 1930. 8×5 *inches;* xvi+348 *pages.* $4.00 (18*s*)

This book describes events in Trans-Mississippian Territory, north of New Spain, from the beginning of the nineteenth century to the Removal Act of 1830. The territory was dominated by the Osage Indians, and even before the wholesale removal of Indians from east to west of the Mississippi, it was the scene of unending skirmishes between such bodies of Indians (notably parties of Cherokees and Choctaws) as had already made the crossing. It is with these struggles, and with the reactions of this miniature warfare on pioneer settlement, that the story is concerned.

The author has searched through much unpublished manuscript material, more especially that available in the official archives at Washington, and this

forms the basis of the work. He has, we feel, kept too closely to his notes. The work suffers from some of those defects so usual in the modern historical thesis. It is encumbered with footnotes, and one loses any comprehensive view or ordered narrative in a mass of detail. For the layman, at any rate, it would have been helpful had an introductory chapter been inserted indicating the place and importance of the events recorded in the history of American expansion. Further, the geographical factor has been ignored, and the book, which makes a definite contribution to historical study, is of little geographical interest. Ll. R. J.

REISE NACH SÜD- UND MITTELAMERIKA, 1927–28. By KARL SAPPER. (Mitt. Geogr. Ges. zu Würzburg, 3–4 Jhg.) 1929. 184 *pages; and illustrations*

Prof. Sapper was invited by the "Institución cultural Argentino-Germana" in Buenos Aires to deliver a course of lectures on Central America. With the financial support of several German bodies, he was enabled to extend his tour so that it included most of the republics of South America. His book is largely a day-to-day journal of the places he visited and the people he met, interspersed with brief impressions of the geography and social developments of the regions traversed. After his stay in the Argentine he crossed to the Pacific coast, travelled to the south of Chile, and then turning northwards visited in turn the western states of South America and thence Central America. If his journal reads at times like a mixture of a time-table and a directory of those with whom he came in contact—particularly the Germans he visited in schools, factories, and Government offices—at others it contains useful information on present-day conditions: for example, recent volcanic disturbances in the Cordillera, the destruction of the Araucaria forests, and nitrate workings in the Chilean desert. Part of his object was to strengthen relations between German and South American scientists, but he also inquired into the prospects before German emigrants. The failure of a recent attempt in Panama is briefly described. Altogether, his six months seem to have been very busy ones. G. R. C.

WISSENSCHAFTLICHE ERGEBNISSE DER DEUTSCHEN GRAN CHACO-EXPEDITION (LEITER HANS KRIEG): VÖGEL. By ALFRED LAUBMANN. *Stuttgart: Strecker und Schröder* 1930. 10×7 *inches;* xvi+334 *pages; illustrations and maps. M.*46

The German Gran Chaco Expedition under the leadership of Professor Hans Krieg, the Director of the Zoological Museum of the Bavarian State at Munich, spent about sixteen months between July 1925 and November 1926 travelling through the Gran Chaco Region of South America. From Ascención the Expedition travelled across the Chaco along the line of the Pilcomayo River to the foothills of the Cordillera, and thence north to Santa Cruz in Bolivia. They then turned eastwards to Corumba, in Brazil, on the upper waters of the Paraguay river and thence down the river to Buenos Aires. Very large collections were made in every branch of Zoology and careful observations on the Geography and Ethnology of the regions traversed. The present volume is concerned only with the very considerable collection of birds made by the members of the expedition, and is the work of Professor Laubmann of the Zoological Museum in Munich, who however was not himself a member of the expedition.

Most of the report is taken up with a careful systematic list of the species of birds obtained. This contains many valuable discussions on questions of taxonomy and nomenclature, and is illustrated by some excellent photographs of the birds themselves, of their nests and of characteristic scenery, but there is very little in the matter of notes or personal observations in the field, as might have been expected. In his introduction Dr. Laubmann discusses at some length the

zoogeographical and ecological relations of the Gran Chaco. He distinguishes three main regions—the dry and trackless "pampas" plains to the south, the Chaco proper with its swamps and dryer zone with scattered trees, and the tropical zone to the north along the watershed between the Rio de la Plata and the Amazons system, and this probably is the portion which will be of greatest interest to readers of this *Journal*.

We notice with considerable surprise that no mention is made of Professor J. Graham Kerr's expedition to the Gran Chaco. He visited that region twice in 1890 and 1896 to obtain the ova and young stages of the Lung-fish *Lepidosiren* in order to work out the embryology. Accounts of his visits and all the birds obtained appeared in *The Ibis* (1892, p. 120, and 1901, p. 215), and there is a short note on the first journey in the *Proceedings* of the Royal Geographical Society (vol. 13, 1891, p. 39), but no reference to Graham Kerr's work appears in Dr. Laubmann's account of the birds of that region.

Additional volumes are promised dealing with the geographical results and the Indians, by Dr. Krieg himself, with the Reptiles and Amphibians by Dr. Müller, and on the Insects by Dr. E. Lindner, who was a member of the expedition. W. L. S.

PERU FROM THE AIR. By Lieut. G. R. JOHNSON. With Text and Notes by RAYE R. PLATT. Special Publication, No. 12. *New York: American Geographical Society* 1930. 10 × 11 *inches;* xii + 160 *pages; illustrations and maps.* $5

The use that aeroplane surveys may be to geography is well illustrated by this valuable album of the surface features of Peru. The geographical structure of many parts of that country is inadequately known, for they are difficult of access and consist of labyrinths of deep valleys, separated by densely forested mountains, as heavy rain occurs throughout the year, and the country is often covered by mist and cloud. This aeroplane survey was greatly hampered by fog, as for months together along the coastal belt the sun is invisible and the observers had to wait for weeks until the clouds were 1500 feet high and photography was possible beneath them. Some of the primary problems in the structure of Peru are still unsolved.

The volume consists mainly of a series of beautiful photographs taken by Lieut. Johnson when serving as Chief Photographer to the Peruvian Naval Air Service. They help in the realization of the nature of the country and supplement the existing maps. The plates are accompanied by a lucid introduction by Mr. R. R. Platt.

Peru consists of three belts: the coast zone, the Andes, and the eastern valleys. The volume, as the work of the naval service, is naturally concerned mainly with the coastal zone, and it deals especially with the northern part. The views show many of the thirty ports which serve the irrigated valleys at the western foot of the Andes and graphically explain the special development due to their isolation by desert. Of the coastal belt only 3 per cent. is cultivated, yet that amounts to one-sixth of the cultivated area of Peru, and its produce is as much as that of the rest of the country, and its exports of sugar and cotton alone are equal in value to the mineral output. Most of the ports are hampered by the heavy surf, and they have no communication with one another overland, as in Northern Peru the mountain spurs come down to the shore and the lower slopes and level ground are covered by sand. The rainless desert condition of the country is due to the Humboldt Current which flows up the coast as far as Pt. Parina, near the northern frontier. The photographs show the picturesque features of this indented coast, with its beautiful coves, its drowned topography, the marine terraces which are local and irregular in development with in places one at from 5 to 10 feet and

another at from 175 to 200 feet. The most striking features are the desert characteristics—the widespread dunes, the cover of sand, the salt pans, and the conspicuous white caps of guano on the islands. One photograph shows the railway rising inland from Ancon, north of Lima, by a series of hairpin bends; but the impression that might be drawn from them would be misleading but for the warning that these bends are "quite unnecessary" and "were devised by the contractor to increase the construction mileage." The views include an instructive illustration of Pisco and its adjacent deserts; south-east of this port is a long stretch of coast of which evidence would be especially useful; but there is nothing until reaching the neighbourhood of Mollendo. Thence a line of photographs was taken across the Andes in the belt that includes the survey by Dr. Bowman and the Arequipa to Titicaca railway. This line was selected as being so well known that the geographical features could be judged from a new point of view. In this traverse the most spectacular photographs are those of the lofty extinct volcanoes. The western part is a high plateau of which the general features and the profound canyons with their cultivated floors and irrigation channels on patterns like those in Western China are shown in many well-selected and striking illustrations. Of Eastern Peru, on the other hand, the views are relatively few. They are mainly of the river ports at the heads of navigation on the tributaries of the Amazon. The facts shown are different from what might be inferred from the maps. They suggest that despite some progress, as at the Peruvian Corporation's plantations in the Chanchamayo Valley, the exploitation of the country has receded in the past twenty years. These photographs do not include the eastern front of the Peruvian Andes, which a series of photographs like those of the north-west coast might do much to elucidate. The illustrations in this volume have been selected to illustrate the known features of the country rather than to help in the solution of its unknown structures. J. W. G.

DER UNVOLLENDETE KONTINENT. By COLIN ROSS. *Leipzig: F. A. Brockhaus* 1930. 8×5 *inches;* 282 *pages; illustrations and sketch-map. M.*8

The author of these interesting sketches of Australia and of Australian life was more than a passing visitor to that continent. Though he travelled extensively, his sojourn was sufficiently long to include a residence with his family as ordinary citizens in Sydney. Thus to the somewhat conventional travel impressions, and to the geographical thesis implied in his title, "the empty continent," he is able to add first-hand experiences of Australian social life. He emphasizes the democratic outlook, the consequences attendant upon devotion to a general high standard of life, and the increasing popularity of sport as an outlet for energies unexhausted by everyday life under a "collectivist" regime. He declares that this is the goal to which the democracies of Western Europe and Northern America are moving, and that similar problems will rise to be solved by them. This opinion has probably been modified by recent events. The photographs are varied in subject, and in many cases usefully supplement the text. G. R. C.

THE MAORI YESTERDAY AND TO-DAY. By JAMES COWAN. *Auckland and London: Whitcombe and Tombs* 1930. 9×6 *inches;* xii+266 *pages; and illustrations.* 12*s* 6*d*

This book is avowedly intended by its author to replace a twenty-year-old volume, 'The Maoris of New Zealand,' which is now out of print. One's immediate impulse is to urge the publishers to reprint the earlier volume at once. Whatever the new version's virtues, it is in no sense a substitute for its predecessor, and Mr. Cowan must know that better than any one. No one is more fully qualified by years of close association with many tribes to understand and

to explain the Maori traditions, customs, and aspirations; but from this book he has—obviously with deliberate intent—omitted practically everything that could suggest the peculiarly Maori type of civilization. Almost the first glimpse he gives us of the tribes parades them as farmers and dairymen, and the "economic survey" with which he concludes again stresses their dairy factories and their wheat farms. One begins to appreciate the underlying sadness of his reference to "some of the last of the elder race, whose lineal successors are engrossed in new interests, new duties, and pleasures."

It is all to the good, of course, to have a trustworthy picture of the new Maori generation, "an element of the New Zealand population that exercises a marked influence on the life of our country." Interest is stimulated by the incorporation of a romantic element, embodying survivals of ancient beliefs and handicrafts. Mr. Cowan does all this with a sure and cunning hand, as he did twenty years ago. What he did not do twenty years ago was to bowdlerize. The Maori of to-day is, after all, descended from the most virile (occasionally brutal) and martial of the Polynesian races, and it is unfair to him and his remarkable capacity for resistance to exotic aggressions carefully to suppress or minimize his non-European characteristics. He was a cannibal; he was, when occasion offered, very nearly the Antipodean equivalent of a Hun; he had, further, the virtues which managed to co-exist with those defects. To give him credit for all these qualities, as Mr. Cowan did in his earlier volume, is to emphasize his innate powers of self-reorganization; but in this book they are all slurred or concealed, and he becomes merely a respectable citizen with a mildly romantic boyhood, eagerly imitative of the supposedly superior European civilization.

In fine, 'The Maori Yesterday and To-day' (its title is exactly descriptive) is pleasant and trustworthy reading on its own merits. But as a substitute for 'The Maoris of New Zealand' it is a hopeless failure. A. J.

FIFTY YEARS IN MAORILAND. By JAMES T. PINFOLD, D.D. With a Foreword by ELSDON BEST. *London: The Epworth Press* 1930. 8 × 5 *inches; 200 pages. 6s*

One's abiding impression of this book is that it imperatively needs an index. It is essentially a collection of memories, opinions, and information gathered by the author from many sources (not all reliable); it is more or less tabulated under vague chapter-headings—"Maori Life and Character," "Loyalty, Royalty and War," "Legislative Enactments," and so on—but is otherwise quite unorganized, so that one cannot track down any special topic, and hopeless confusion is the inevitable result of an attempt to read straight on. For instance, the history of New Zealand missions, a subject of special interest to the author, must be pursued from chapter i to chapters v, vi, viii (where the story really begins), and xi. "Legislative Enactments" begins with the story of a Maori who hit his wife because she cooked badly, with the result that she and her father cooked and ate him; it meanders through the very variegated legislation of seventy years (including the famous Bill for licensing washerwomen), and ends with the trial of a bishop for seditious utterances.

It is impossible to deal seriously with such a volume. One can only assure readers that Dr. Pinfold is evidently a gentleman to whose table-talk one would contentedly listen on a summer evening. To be introduced to his material in book form abolishes the mellowing atmosphere of the New Zealand twilight, and leaves us with a mass of disjointed statements, whose complete accuracy immediately comes into question. A. J.

JUNGLE ISLANDS: the *Illyria* in the South Seas. (The Record of the Crane Pacific Expedition. Field Museum of Natural History, Chicago.) By SIDNEY NICHOLS SHURCLIFF. With a scientific appendix by KARL PATTERSON SCHMIDT. *New York and London: G. P. Putnams Sons* 1930. 11×8 *inches;* xvi+298 *pages; illustrations and maps. 2 guineas*

No sooner had the *Illyria* put to sea than "all hands turned in for some much needed sleep." Unfortunately the mechanism of the automatic control of this remarkable boat is not described. Only a sense of duty induced the reviewer to read right through this book; and his conscientiousness was rewarded, for the last chapter is quite an interesting account of a journey up the Sepik River in New Guinea. It is difficult to imagine why the publisher agreed to print the first half of the book. Nothing interesting or exciting happens. Every little event is exaggerated in an attempt to make it seem exciting. The cook smells some rotten meat: we are told that he is unconscious for six hours. A gaff penetrates "nearly an inch" into the palm of the author's hand: it "nearly heals" the same day. Some incidents one can believe. The scientists of the party are landed on an island for the purpose of catching rats. When left by themselves, they find that they have forgotten their blankets, their cooking utensils, and their rat-traps. The author goes out to shoot cattle in the Galapagos Islands, and shoots a horse by mistake. Sometimes we have little glimpses of the obvious. "However, the coming of night did make us witness one interesting scene which the people who go through the canal by day never see, namely, the nocturnal operation of the locks."

There is an able appendix on the zoo-geography of the Pacific, but it contains practically no new material. There are some excellent paintings of animals, and some of the photographs are good. The reader may consider two guineas rather a lot to pay for these and the chapter on the Sepik River trip, unless indeed the catalogue of the nicknames of all the members of the expedition appeals to him.

J. R. B.

JORULLO: The History of the Volcano of Jorullo and the reclamation of the devastated district by animals and plants. By HANS GADOW. *Cambridge: At the University Press* 1930. 9×6 *inches;* xviii+100 *pages; illustrations and map. 7s 6d*

Despite the Editorial Note by Mr. Philip Lake and the two prefaces, by the late author and Professor A. C. Seward respectively, the genesis of this book is not made quite clear. It is not without some trouble that one arrives at the conclusion that Dr. Gadow's visit to Jorullo must have been in the summer of 1908, and this still leaves the date of writing doubtful. Mr. Lake says that the MS. was left almost ready for press, and that it had been probably held up after writing with the idea of publication as part of a larger volume on Mexico which Dr. Gadow contemplated; but this of course tells us nothing of the actual period of composition or revision. The point is of some importance, because Chapter IV, entitled the Amphibians and Reptiles of Michoacan—itself without any very obvious bearing on the main subject of the book—contains an interesting statement on the much-debated subject of the origin of the Galapagos islands, and it would be interesting to know when the conclusion drawn was arrived at. The statement is that during the Miocene period Mexico extended considerably farther south and west than at present, and then included not only the Gulf of California and such islands as the Tres Marias, but also the relatively distant Revillagigedo and Galapagos groups.

The main subject of the book is indicated by the sub-title, and is dealt with in three chapters, the first giving the story of the eruptions which, beginning in June 1759, completely buried 5 square miles of fertile land under lava sheets,

devastated a much larger area, and led to the rise of the volcanic cone of Jorullo and its satellites. In order to render this chapter more intelligible Mr. Lake has added a very clear preliminary account of the volcano and its surroundings, and accompanies this with a sketch-map. The next two chapters deal with the reclamation of the area within which serious destruction must have occurred, estimated as at least 26 square miles, by plants and by animals, particularly reptiles and amphibia, the forms on which Dr. Gadow was a recognized authority. The contents of Chapter IV have been already noted, and the book ends with a useful appendix containing extracts of the literature dealing with Jorullo, and including translations from the Spanish of the reports of eye-witnesses of the first outbreaks. Two sketches by Mrs. Gadow and a photograph of Dr. Gadow are added, but there is no index.

As this account shows, all Mr. Lake's careful editing has not deprived the book of its character as a fragment of an uncompleted scheme. But it is full of interesting points of detail, and was well worth publication, if only because of the analogies—with well-marked differences—which the area presents with the reclamation of Krakatoa by plants after the great eruption of 1883, a point emphasized by Professor Seward in his prefatory note. Particularly interesting is the account of the re-colonization of the volcanic sands by a palm, on whose trunk epiphytic orchids lodge, making a suitable nursery for the seeds of a fig, apparently transported by fruit-eating bats. Only one fig grows on each palm, and it is at first epiphytic, but in course of time sends down buttress roots to the ground, smothers the palm, and becomes a gigantic tree, beneath whose shade undershrubs develop, converting the lifeless plain into savanna country. Where the fig is absent, the ground below the palms remains mainly bare, save for a short-lived growth of herbaceous plants after the rains. The palm-orchid-fig-undergrowth-savanna sequence is thus a beautiful example of what the ecological botanist calls a succession. M. I. N.

ECONOMIC GEOGRAPHY. By R. H. WHITBECK and V. C. FINCH. *London: McGraw-Hill Publishing Co.* 1930. (2nd Edition.) 9×6 *inches;* x+566 *pages; illustrations and maps.* 17*s* 6*d*

This text-book by American authors for American students remains essentially unaltered in scope and arrangement from the first edition (1925), though statistics have been brought up to date. Apart from the continent of North America, however, and especially the United States portion of it, the treatment is far too severely compressed to be of much use to English students. Diagram maps and illustrations are numerous and good, and each chapter has a short bibliography.

R. O. P.

REPORT OF THE SCIENTIFIC RESULTS OF THE NORWEGIAN EXPEDITION TO NOVAYA ZEMLYA 1921. Edited by O. HOLTEDAHL. Volumes II, III. *Oslo: Det Norske Videnskap Akademi* 1928–30. 11×7 *inches;* 550; 522 *pages; illustrations and maps*

A long paper on the Rock Formations of Novaya Zemlya is the most important geographical contribution in Vol. II of these results. In this paper Professor Holtedahl traces the geological history of the islands. It was in Permo-Carboniferous times that the rocks in that area were folded into the complicated structure of which the ruins are now to be seen. At the same time there were igneous intrusions. During Mesozoic times the area was mainly above sea-level and was not, in Professor Holtedahl's opinion, a geosyncline. The author also discusses the probability of a palaeozoic geosyncline connecting Novaya Zemlya with the Urals and Alaska. After debating the evidence in full he shows physical and palaeontological likenesses between the two lands which point strongly to

such a geosyncline. The New Siberian islands are probably south of this zone. Franz Josef Land lies to the north. In the Alaskan end of the zone folding however appears to have been of Triassic-Jurassic age rather than earlier as in Novaya Zemlya. And all these movements were later than the Caledonian folds of Scandinavia, Spitsbergen, Northern Greenland, and Ellesmere Island. This work also raises the problem of the age of the Arctic Sea, since the bordering lands show thick sedimentary deposits of Palaeozoic times that preclude the likelihood of the basin being a permanent feature.

In another paper Dr. O. Edlund discusses the available meteorological data and takes a survey of the climate of Novaya Zemlya. The remaining papers are mainly zoological.

Among the papers in the third volume is a long one by Dr. B. Lynge on the lichens. Most of it is devoted to an enumeration and description of species, but there is some discussion of ecology. Lichens seem to be better suited to the Arctic climate than vascular plants, and a study of their habitat shows the close relation between lichen growth and soil, exposure, and nitrogenous matter. Such factors are of greater importance than the presence or absence of glaciers in the vicinity and correlated temperatures. Another important paper is by Dr. F. Ökland on Land- und Süsswasserfauna von Nowaja Semlja. A feature of most of the papers is the lengthy bibliographies. There are many illustrations.

R. N. R. B.

AERONAUTICAL METEOROLOGY. By WILLIS RAY GREGG. *New York: The Ronald Press Co.* (*London: Simpkin, Marshall*) 1930. (*Second edition.*) 9×6 *inches;* xvi+406 *pages; illustrations and maps.* $4.50 (20s)

The author, who is Principal Meteorologist in charge of the Aerological Division of the United States Weather Bureau, states in the preface that his purpose is to give in concise form the essential facts of the upper air and to point out their relation to the development and safety of aeronautics. He has achieved a high degree of success, and though the detailed information relates to the United States, the book contains much information of value to those interested in the development of aeronautics in other parts of the world. There is little purely theoretical discussion of meteorology, and the author has kept in mind throughout the needs of the practical aviator.

Starting off with a brief account of the general circulation of the atmosphere, the author next proceeds to discuss the relation of wind to pressure distribution, and to describe different classes of wind—trade winds, monsoons, land and sea breezes, mountain and valley winds, and Chinooks. He then describes the instruments normally used in ordinary meteorological observations. Subsequent chapters deal with the changes of pressure, temperature, humidity, and wind with height, and useful tables of frequency of winds of different velocities and directions are given for a range of heights, the data referring to the Eastern and Central regions of the United States. The discussion of the physics of fog formation is clear and ample, and is supplemented by frequency tables for the same region. There are short clear treatments of the classification of clouds, of ceiling and visibility, thunderstorms, tornadoes and waterspouts, and Norwegian methods of forecasting.

Special reference must be made to the chapter on Airship Meteorology which discusses in some detail the nature and importance of details of wind structure and temperature distribution, and to the chapter on surveys and equipment for airship bases. These two chapters contain much information of interest and value, not only to airships, but also to heavier-than-air craft. The chapters on North Atlantic and Arctic Meteorology, and on Flying in the Arctic, are of interest to others beside the practical aviator.

The appendices at the end give (i) lists of test questions on each chapter; (ii) distributions of weather information by radio; (iii) Weather Bureau Stations; (iv) meteorological services of the world; (v) a fairly full bibliography; and (vi) a list of constants, conversion factors, and tables.

The author has had the benefit of the collaboration of a number of experts in the preparation of the book, and has been enabled to produce a more complete and useful work than could have been compiled by one author. The material has been well selected, the text, diagrams, and plates are clear, and the book leaves the impression of being a workmanlike achievement, which should interest a wide public. D. B.

A PRACTICAL TREATISE ON MAPPING AND LETTERING, including the construction of the basic alphabets and the elements of map design. By MALCOLM LLOYD. *Philadelphia: P. Blakiston's Son & Co.* 1930. 8×11 *inches;* viii+58 *pages; and illustrations.* $2.50

The author hopes to improve the technique of map-making, which is a good aim, and to standardize it, which is more doubtful. His advice on instruments and materials seems to be sound, but his treatment of map-projections not: his class "conformable" is said to preserve relative shape and size at the sacrifice of the meridians' perpendicularity to the parallels. He classifies the map symbols on Plate IV as hypsographic, hydrographic, and civic, which does not work very well, as the symbol for sand is included in the first and for forest in the third; while cities and towns are not civic, but public works, and must be lettered in slanting block or single-stroke characters, Roman being reserved for civic. The author admires the high degree to which lettering has been developed "in the marvelous hand illuminated manuscripts on vellum of the Middle Ages and the beautiful perfection of modern engraved lettering on bank notes and government maps." So after exhaustive studies of European and American maps to arrive at the most aesthetic proportions, he made an alphabet of "Classic Romans" based on the arch of Septimius Severus, thus obtaining a pretty good set of capitals, though not of the best period, but being less successful with the lower case, which he had to invent himself. At this point, when he was at least on the way to success, his courage failed. He suddenly descended to modern face type in its most over-modelled form of about 1860, with thick strokes wide as one-sixth of the letter's height and the finest of hair lines. From this he derives an Italic by direct graphic projection "in which the personal factor has been eliminated," and speaks as if that were an advantage. Mr. Lloyd holds the old heresy that the serifs may conveniently be joined up and the letters thus run together. His block letters and single-stroke alphabets have little elegance to commend them; and he writes as if indifferent to all that has been done and said for fine lettering during the last thirty years. A. R. H.

INTERNATIONAL MIGRATIONS. Volume I. Statistics: Compiled on behalf of the International Labour Office, Geneva, with Introduction and Notes by IMRE FERENCZI, and edited on behalf of the National Bureau of Economic Research by WALTER F. WILLCOX. *New York: National Bureau of Economic Research* (*Publication No.* 14) 1929. 9×6 *inches;* 1112 *pages; diagrams and tables*

In 1925 the American National Bureau of Economic Research made an offer to the International Labour Organization to finance an historical inquiry into international migration statistics. The acceptance of this offer was recommended by M. Albert Thomas, the Director of the International Labour Office, and the proposal was agreed to by the Governing Body of the International Labour Organization. This sort of investigation and publication is costly. In this case

the American National Bureau placed a total of some £2500 "at the disposal of the Inquiry." The large volume under review consists of an Introduction of 175 pages by Dr. Ferenczi, followed by a wilderness of 859 pages of statistics. The term "wilderness" is used in no disparaging sense, but to give the impression of the enormous labour and effort necessary to travel through it. Statistics are, of course, indispensable for the proper understanding of matters dealing with population movements; and here we have a great mass of information of a very reliable character, the collection and arrangement of which reflect much credit on the able compiler. The book will certainly take its place as a leading authority on the subject.

The Introduction contains many matters of interest. It is a digest of international and national statistics, so far as these are available on the subject of migrations. Let us take, as an instance, the compiler's treatment of the facts relating to China. He begins by saying that, "Long before the nineteenth century the teeming population of the Chinese provinces flowed over into neighbouring Asiatic countries, and during the last century this tendency was accentuated. Statistics of the movement are, of course, almost non-existent." He points out that the number of emigrants cannot be derived from population statistics, but that an idea of the results can be derived from them. Thus, he quotes from Ta Chen a table giving the total number of Chinese residing abroad in 1922; this total amounted, apparently, to a little over 8,000,000. Of these Burma accounted for 134,000; Hong Kong for 314,000; and the Straits Settlements for 432,000. But Formosa is credited with 2,258,000. As a kind of check the author gives, in a note, the figures estimated by Philippovitch for the beginning of the century; his total estimate came to a little over 5,000,000. So that, if we accept both estimates, it would follow that, including natural growth, the number of Chinese abroad increased by 3,000,000 in twenty-two years: about 136,000 a year. It is worth noting that the figures for Burma show an increase during the twenty-two years of nearly 100,000.

This sort of curious and valuable information will be found under the heading of each country. A most interesting diagram shows, for instance, the immigration, from outside the continent, into America and into the United States alone, for the 104 years 1821 to 1924. One can roughly see from the diagram a series of minima occurring with some regularity every twenty years, at least that is how it looks to the present reviewer; the minima are at the points 1840, 60, 80, 1900, 1920, or near those points.

The book will be indispensable for all serious students of migration questions. It is to be followed by a volume of "interpretative studies of migration statistics written by scholars in different countries." This sentence is taken from the Preface written by Mr. Walter F. Willcox, who is the organizer of the inquiry and editor of both volumes. We look forward with interest to the publication of the second volume. C. F. C.

THE CAMBRIDGE ANCIENT HISTORY: Vol. VIII. Rome and the Mediterranean, 218–133 B.C. Edited by S. A. COOK, F. E. ADCOCK, and M. P. CHARLESWORTH. *Cambridge: University Press* 1930. 10×7 *inches;* xxvi+840 *pages; and maps.* 35*s*

THE CAMBRIDGE ANCIENT HISTORY. Volume of Plates III. Prepared by C. T. SELTMAN. *Cambridge: University Press* 1930. 10×7 *inches;* xiv+198 *pages.* 12*s* 6*d*

The eighth volume of the Cambridge Ancient History appropriately opens with a chapter on Polybius, the pioneer of historical geography and interpreter of the Hellenistic Age, to whose work the subsequent pages owe so much. In these the

wars of Rome with Carthage, Macedonia, Greece, and Syria, resulting in her dominance of the Mediterranean, are retold, and the narrative, in virtue of its lucidity, restraint, and judicial attitude, suffers nothing in the retelling. While these conflicts are of no special interest to the geographer (except Hannibal's route over the Alps), their influence on Hellenistic commerce and its development claim his attention. Constant war, with the piracy it favoured, interfered with the supplies of food and raw materials of the Hellenistic peoples. The transport of foodstuffs was of vital importance to them, and in the commerce concerned in the supply and distribution of the most important commodity, corn, a great part was played by the little island of Rhodes. This was largely due to her geographical situation. Her position between Egypt and Cyprus, the Syrian coast, and the world of Greek cities, made her an important intermediary between Greece and the East, and enabled her to concentrate a large volume of trade in her harbours, and to support a considerable population in her towns. She was thus able to build up a large fleet which gave her the power to combat the piracy endemic in the Aegean, and to earn the reputation of being the champion of freedom of the sea.

In addition to the commercial intercourse between the different states of the Hellenic system, extensive commercial relations were set up with the non-Hellenic world, reaching far to the east, south, and west. This was effected by several kinds of communication, as the caravan, river, and maritime trades. For these the development of roads and shipping was necessary. Unfortunately, the knowledge of these subjects which has come down to us is very meagre. The importance of shipping however is apparent from the attention paid to ship-building and naval training as *e.g.* in Rhodes, the improvement of harbours, and the establishment of lighthouses, of which the most famous was the Pharos of Alexandria.

The growth of geographical knowledge is evident from the *periploi* of this period, revealing an acquaintance with the Mediterranean shores, the Black and Red Seas, and the Persian Gulf. The wide extension of currency and banking proves that commerce was developing and spreading. Little is known about the organization of this commerce, but it was no doubt favoured by the spread of the Greek language. We can well understand that Greek should be used in Hellenistic Egypt, and by Macedonians on the Euphrates in business transactions. But it is astonishing, as Professor Rostovtzeff remarks, "how rapidly parchment and papyrus replaced clay tablets in Mesopotamia, and how the Babylonian language retreated before the Greek, and to a certain extent the Aramaic and Iranian languages. And still more surprising that the Parthians, Arabs, Kurds, and Iranians in Mesopotamian and Iranian lands use in their transactions the Greek language and Greek legal formulae, and to a certain extent Greek laws and regulations." It can only be explained as being due to the penetration into these regions of many Greek business men, and to their trade being of very real importance to these peoples.

The last chapter is devoted to Hellenistic Art, in which the sculpture, painting, and architecture of the period are briefly reviewed, concluding with a reference to town planning, illustrated by a plan of Priene. This subject is more fully illustrated in the 'Third Volume of Plates,' prepared by Mr. Seltman, as a companion to vols. vii and viii of the History. In this a long series of plates are given showing examples of painting from Pompeii and Herculaneum, of architecture from Delos, Miletus, and Pergamum, and of Hellenistic sculpture. Very fully illustrated are many artistic finds from Thrace, and from the Bosporan kingdom, so well treated in vol. viii by Professor Rostovtzeff, in whose opinion there is no praise too high for what some of its artists achieved. The chapter on the Celts

in vol. vii is illustrated by weapons, fibulae, jewellery, bronze vessels, and pottery of the La Tène period: also Celtic coins, among them derivatives from the gold staters of Philip of Macedon. There are several finely produced plates of the coinages of Hellenistic Greece, Asia Minor, Italy, Syracuse, Macedon, Thrace, Bosporus, Syria, and Carthage. Coins are called into request to illustrate portraiture. On these the supreme skill of the Greek artist shows us a series of portraits of monarchs from Alexander the Great to Cleopatra VII. Carthage, which looms so prominently in these volumes, made but a poor contribution to the art of the age, and is represented only by a votive stele and a terra-cotta figure of the Punic goddess Tanit, and a marble figure of a priestess. Two terra-cotta masks added are of considerable interest, if, as suggested, they represent typical Carthaginian features. E. A. P.

TUDOR GEOGRAPHY, 1485–1583. By E. G. R. TAYLOR. *London: Methuen & Co.* 1930. 9×6 *inches;* ix+290 *pages; and illustrations.* 15*s*

To place the history of Elizabethan exploration in its true perspective, Professor Taylor was led to an examination of general geographical conceptions prior to 1583. The foundation of this study is a bibliography of all English geographical writings in manuscript or printed form which she has been able to trace. This list is printed as an appendix to the present work, the first two chapters of which are a running commentary upon it. Though the list proves what, from general considerations, would be expected—that English geographical literature before the middle of the sixteenth century was poor in quantity and quality—it should be very useful to future students in this field. The bibliography, which represents considerable research, is arranged chronologically, and includes many works known only by their titles. In some instances, the exact character of the entry must be determined by reference to the body of the work, and one or two discrepancies are revealed on comparison with other catalogues. The provenance of the MSS. might perhaps have been noted.

Professor Taylor then proceeds to indicate the various continental influences which contributed to the early development of the science in England. Progress was naturally more rapid in the domain of practical navigation: Spanish manuals of navigation, French "rutters," and German astronomical and cosmographical works all contributed to this advance. Among the documents in the British Museum which Professor Taylor has, for the first time, thoroughly examined, is Jean Rotz's 'Traicte des differences du compas aymente,' which describes at length his 'Differential Quadrant," or meridional compass, in which she sees a precurser of the theodolite (see *G.J.*, 73, 1929, 455–459). Another document adequately discussed for the first time is Roger Barlow's 'Geographia,' formerly attributed to William Barlow, Bishop of St. Davids (see *G.J.*, 74, 1929, 157–170). This dates from 1540–41, and the extracts quoted justify the writer's claim that Barlow must rank as the first English systematic geographer.

The real stimulus to English geography came from the voyages of the Elizabethans, but one of the main objects of Professor Taylor's book is to show that the voyages of Frobisher, Drake, Gilbert, Pet, and Jackman were carefully planned in accordance with current geographical conceptions, however erroneous these were subsequently proved to be. The moving spirit was Dr. John Dee, whose character as a serious geographer is here vindicated, and who is shown to have been the link between the "theorists"—he numbered Gemma Phrysius, Pedro Nuñez, Mercator, and Ortelius among his friends—and the explorers. The geographical writings of Dee and the contents of his library should absolve him from the charge of charlatanism, to which his addiction to astrology and the seeking of the "philosopher's stone" has exposed him.

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The book concludes with a chapter on practical navigation and surveying which embodies, in greater detail, the results of research already published in this *Journal* (71, 1928, 472–479, and 72, 1928, 329–341) and elsewhere, including the reproduction of an actual piece of plane-tabling, dating from 1571, by William Bourne, another Tudor geographer who owes his rehabilitation to Professor Taylor.

What the general reader will probably miss from this essay is the absence of any but incidental reference to physical geography, or rather, perhaps, to the processes of physical geography. The writer quotes an early description of the 'Mediterranean climate' (from a pilgrim's handbook of 1498); the 'Interlude of the Four Elements' (*c.* 1519) promises to treat "of the generation and cause of well-springs and rivers," and "of the cause of rain, snow and hail"—Professor Taylor does not indicate whether it did so—and a work 'A discourse upon the Earthquake that happened throughe this Realme' (incompletely quoted in the appendix) appeared in 1580. The position was that during this period the methods of mediaeval schoolmen were being abandoned, and explorers were embarking upon that accumulation of observations upon which the science was later to be erected. Professor Taylor's work as a whole seems to lack a general chapter to make this position clear and to bind her separate studies together. She promises a further volume which will deal with the succeeding period for ever associated with the names of Hakluyt and Purchas. Under her treatment it should yield important results, for despite the work already done, the true stature of Hakluyt as a geographer has yet to be revealed. G. R. C.

YMAGO MUNDI DE PIERRE D'AILLY. Edited by E. Buron. Tomes I and II. *Paris: Maisonneuve Frères* 1930. 11 × 7 *inches;* 549 *pages; illustrations and diagrams.* 3 *guineas for the* 3 *vols.*

The *Imago Mundi* of Cardinal Pierre d'Ailly, Bishop of Cambrai, is among the books that are far more frequently quoted than read: and for this, indeed, there is some excuse, since even at the British Museum there is but one copy of the manuscript, and one of the printed, version. The appearance of a modern reprint is therefore an event of importance, and the more so as it has been made from Columbus' copy and includes the underlining and marginal notes attributed to him, although these last have, of course, been reproduced before.

The book is a collection of sixteen tracts published under the title of the first, and was originally written between 1410 and 1419. After being widely circulated in manuscript form, it appeared in print at some time between 1480 and 1490. Four only of the tracts deal with cosmography, the remainder are astronomical: of the four, the *Imago Mundi* and its Epilogue epitomize the best geographical thought of the Fathers and of the Schoolmen, while the two remainder introduce the reader to the newly recovered Geography of Ptolemy. Written as it was when Prince Henry the Navigator was growing into manhood, and serving as the standard text-book of the fifteenth and early sixteenth centuries, no other work throws a clearer light on the geographical thought of the Great Age of Discovery, and that quite apart from its special relationship to the Columbian problem.

Of this problem the solution has not been advanced by M. Buron, the editor of the text under review, for he too hastily brushes aside the difficulties surrounding the authorship of the marginal notes and the dates of their inscription. Nor does the knowledge he displays of mediaeval geography incline us to place confidence in his handling of the critical and intricate problems that are involved. To say of Columbus: "Il est mort en respirant l'encens d'une gloire fausse: celle d'avoir passé de l'Espagne aux Indes" suggests no very close familiarity with the

tragedy of the Great Discoverer, and it is far from the truth to say that it is only necessary to read his Letters and Journals "sans parler de son livre de Prophéties" to be convinced of his knowledge and competence in matters of cosmography and navigation. M. Buron is betrayed by his own lack of cosmographical knowledge and of scientific training, as, for example, when he seeks to defend Columbus' measure of the degree (which in point of fact needs no justification) by such a counter-attack as the following: "Il y a peut-être encore *à l'heure qu'il est* quelques esprits exigeants qui prétendent que la mesure du degré telle qu'elle est calculée en Angleterre n'est pas rigoureusement exacte." The "esprit exigeant" in question has been dead for over a century, but this does not appear from M. Buron's text, nor would he probably consider the fact relevant.

Again, of the precursors of Columbus he writes: "Des Génois, les frères Vadino et Guido Vivaldi avaient navigué autour de l'Afrique au XIII^e^ siècle, les Vénétiens étaient allés dans les Flandres au XIV^e^ siècle, tandis que d'autres, les frères Zeno allaient en Island et même au Groenland et que les Dieppois s'établissaient en Guinée. Ces souvenirs et la rennomée de ceux qui, Italiens et autres, avaient découvert des îles dans l'Atlantique, exerçaient une puissante influence sur les esprits." Apart from the fact that the Vivaldi brothers never circumnavigated Africa, that the Flanders galleys followed a coasting route known for centuries, that the mythical Zeni voyages were first heard of in the sixteenth century, and the early establishment of Dieppois in Guinea is highly problematical, not one of these enterprises has reference to the discovery of Atlantic islands. The task of editing Columbus' copy of the *Imago Mundi* demands, in fact, an erudition in diverse fields such as few individual scholars can command, and while it is to be regretted that M. Buron did not submit his introductory chapters to a specialist in Mediaeval Geography, one could also wish that he had consulted a competent Latinist in respect of his very free rendering into French of d'Ailly's text. "In ea tamen non describuntur orizon meridianus et coluri" does not mean "*L'horizon de midi* et les colures n'y sont pas indiqués," nor is "Quanta vero est elevatio poli super orizontem Tanta est distantia inter zenith capitis et equinoxaliem" correctly translated by "L'élévation du pôle sur l'horizon est *proportionelle* à la distance entre le Zénith et *l'équateur*." Such examples of faulty translation might be multiplied, although it must be admitted that the original is often obscure.

M. Buron has however done a real service to the student by his footnotes to the text. These contain references to, or frequently transcripts of, parallel passages found in earlier authors, and thus throw light on the sources employed by d'Ailly, and on difficult passages in his text. The Cardinal was a great scholar as well as a great Churchman, and relinquished an appointment as Rector of the Collège de Navarre to become Chancellor of the University of Paris. It was here that John of Sacrobosco, Roger Bacon, and Robert Grosteste had taught a century and a half earlier, and d'Ailly has drawn largely upon the works of these three Englishmen. He made free use, besides, of a treatise by another great student of Aristotle, his compatriot Nicholas Oresme (1320?–1380), which under the title of 'Lespere' was written in the vernacular. The manuscript is preserved in the Bibliothèque Nationale.

The 'Imago Mundi' was, in fact, a revised edition of standard cosmographical works that had preceded it, but there is no doubt that d'Ailly was familiar also at first hand with the writings of Pliny and Solinus, of Orosius, Isidore, and Vincent of Beauvais, of Alfragan, Albategni, and Averroës, to name but the best-known of the authors from whom the Image of the World was built up during the thirteenth and fourteenth centuries. Such a standard work usually consisted of two parts,

the first astronomical, leading up to the division of the world according to *climata*; the second geographical, based on the regional division of the world into three parts, Asia, Africa, and Europe. Some writers, as, for example, Aeneas Silvius, following the example of Strabo, limited themselves to the description of the tripartite world.

Among d'Ailly's readers, as we know, was Azurara, author of the 'Chronicles of Guinea,' and doubtless Prince Henry himself, who must have turned with particular eagerness to the chapters on the ante- and post-climata, which treated of the habitability of the Torrid Zone, and of lands under the Tropic of Capricorn. It is here that d'Ailly makes full use of the *Opus Majus* of Roger Bacon, and so made widely current the view that there was a part of India, Patalis, where the shadow always fell south at noon, a theory that found general expression in early sixteenth-century maps. These same sections (including the important *De figura Terrae* in the *Epilogus Mappa Mundi*) were, like the famous chapter viii, very copiously annotated by Bartholomew Columbus or his brother, and were it not for the difficulty of the date, this fact might lend some slight colour to Mr. Cecil Jane's view that Columbus set out to seek a Terra Australis.

The first volume concludes with the thirty-second chapter of the *Imago Mundi*, the second takes the reader to the end of the *Epilogus*. The tracts dealing with the superstitious and the permitted use of astrology are to be omitted, although here M. Buron would find a congenial field, for he sees in the modern discoveries of X-rays and cosmic radiations a confirmation of the theory of planetary influences on human affairs. Geographers however are satisfied to reflect that the intense and widespread preoccupation with astrology to which these tracts bear witness bore fruit in a keen study of cosmography and in an attempt to perfect astronomical instruments and tables which later proved of signal value to navigators and discoverers.

The Bibliography has been somewhat carelessly compiled, many important works cited in the text being omitted, while the number of misprints and slips of the pen both here and in the body of the book is unduly large. The photogravure facsimiles are often both artistic and valuable, but the figures in the text are not so clear as could be desired, and there will be many, like the present writer, to regret that so important a work (doubtless for lack of financial support) was not more carefully produced and edited. M. Buron is himself aware of its imperfection, and pleads for indulgence, while in the closing sentence of his Introduction he reveals alike his enthusiasm and his limitations. "J' avais à coeur de rendre hommage à l'illustre français que je regarde comme *le principal collaborateur* de Colomb sinon comme son inspirateur." E. G. R. T.

SIR JOHN HAWKINS. By PHILIP GOSSE. (The Golden Hind Series.) *London: John Lane* 1930. 9×6 *inches;* xii+290 *pages; illustrations and sketch-map.* 12*s* 6*d*

"The aim of *The Golden Hind Series*," we are told, "is to present, in a form suitable for the general reader, lives of the great explorers written by well-known men of letters which are at once reliable history and attractive biography." On the whole Mr. Gosse may be said to have fulfilled these conditions with success. He disclaims quite frankly any pretence to have discovered new material. Three years ago Dr. J. A. Williamson produced his monumental biography of Sir John Hawkins, which not only re-creates the portrait of the real John Hawkins, but is also the most important contribution to Tudor naval history that has appeared for a generation. Having undertaken to write a further life of Hawkins, Mr. Gosse was accordingly constrained to borrow freely. Indeed, the present work is modelled throughout on its more substantial predecessor. Of this fact the author

makes handsome acknowledgment in his preface, although one could have wished that he had gone a step further and mentioned the title of Dr. Williamson's work.

On certain points the new evidence is neglected. When describing the first Guinea voyage, Mr. Gosse follows Hakluyt in stating that both cargoes sent by Hawkins for sale at Seville arrived at that port, whereas Dr. Williamson, by quoting from the "Libels" and "Examinations" of the High Court of Admiralty, proves that Hakluyt was mistaken and that one of the ships went to Lisbon. On the succeeding page he falls again into error by following Froude. Hawkins proposed to go to Spain in person in order to seek redress for the seizure of his goods. On the strength of a (supposedly hostile) letter to Hawkins from Sir Thomas Challoner, the English Ambassador at the Spanish Court, Froude assumed that the visit was not made, and Mr. Gosse repeats the statement. On the other hand, Dr. Williamson shows that Froude misread this letter, which was in fact very friendly in tone, and that Hawkins' trip to Spain is attested by a letter to Challoner from Hugh Tipton. This visit is important as illustrating the determination of Hawkins to arrive at an understanding with the Spaniards. The description of the second Guinea voyage is drawn for the most part from Sparke's story in Hakluyt, and the Portuguese version of the transactions with their factors on the Guinea coast (State Papers Foreign, Elizabeth, vols. 95 and 99) is ignored. A more serious omission is the failure to stress the attitude which he persistently retained in relation to the Spanish Government. Until the tragedy of San Juan de Ulua he did his utmost to bring about Anglo-Spanish cooperation, while himself enjoying a specially favoured position within the Spanish Empire by making himself useful to Philip. Except for a brief reference (p. 61) Mr. Gosse apparently makes no mention of this, but tends to assume that Hawkins was actuated by ideas that belong to the later period of the reign, when the situation was very different. The chapters depicting the reorganization of the Tudor navy in preparation for the approaching struggle with the Armada reproduce the important findings of Dr. Williamson.

In telling the story of the second voyage the author makes full and excellent use of the documents discovered and translated by Miss Irene Wright in her recent volume, 'Spanish Documents Concerning English Voyages in the Caribbean' (Hakluyt Society, Series II, vol. lxii). Yet here again one deprecates the inadequacy of the acknowledgment. On p. 74 we are told that "since these pages were written Miss Irene Wright has published a most valuable collection of documents," and one of the letters is then transcribed. But in the previous pages no less than eight others have already been reproduced *in toto* without indication of their origin.

It is unfortunate that Mr. Gosse should commit an elementary blunder by stating that in the last expedition (in which both Hawkins and Drake died) Porto Rico was captured.

As a piece of writing the book is admirable. Written in a vivid easy style it holds the reader's interest throughout and establishes a close contact between the hero and the audience. Furthermore, the author exhibits considerable skill in synthesizing his material. Not always reliable history, but certainly an attractive biography. V. T. H.

THE ATLANTIC. By STANLEY ROGERS. *London: George G. Harrap & Co.* 1930. 9×6 *inches; 242 pages; illustrations and sketch-maps.* 7*s* 6*d*

Mr. Stanley Rogers has his public, lovers of what they themselves would term a "breezy yarn," and here they may enjoy them in plenty, illustrated by the author's own clever pen. The book is written to entertain rather than to instruct, and

hence serious criticism is out of place, but attention must be called to some of the more surprising statements. Las Casas, whose 'Historia General de las Indias,' was completed in 1561, was certainly not one of the "trusty companions" of Columbus on his first voyage, and the Journal that he transcribed was not one kept by him on that occasion, but that of the great Discoverer himself. Nor again, was Columbus the first to conceive of the world as round, while the "great pundits" of his age were thinking of it as "flat or cube-shaped or triangular." History however makes up but a small part of this book; piracies, shipwrecks, mutinies, fights, and all manner of adventures are its theme, and whether or not the tales are true makes no matter. E. G. R. T.

BRISTOL PRIVATEERS AND SHIPS OF WAR. By Commr. J. W. Damer Powell. *Bristol: J. W. Arrowsmith* 1930. 10×7 *inches;* xx+412 *pages; illustrations and facsimile maps.* 31*s* 6*d*

His fellow-townsfolk owe Commander Damer Powell a deep debt of gratitude, for he has produced the first book to set forth at all adequately the maritime achievements of Bristol during the great age of sail. The work is encyclopaedic, for the author refers by name to more than nine hundred ships, Bristol-built or Bristol-owned, and gives something of the history of each. The comparatively short account of the men-of-war, less than thirty in all, built at Bristol is not of any very serious importance, for particulars of these are available elsewhere, but Commander Damer Powell's description of the Bristol privateers and letters of marque ships breaks entirely new ground. Until the publication of this work, it could be said with truth that, except in the case of East Indiamen, the large privately owned ships, chartered by the Honourable East India Company voyage by voyage, only the most happy chance could produce details of any individual merchantship of the seventeenth or eighteenth centuries. The registry of the Port of London does not begin until 1786, and even then, in its early years, it is by no means complete.

Commander Damer Powell however has tapped the hitherto unused records of the warrants issued by the Admiralty to privateers and to letters of marque ships and the declarations made by their commanders. Of these the Public Record Office contains a vast collection, dating from 1549 to 1815, and it is to be hoped that the author's example in investigating these may be followed with equal success by enthusiastic partisans of our other great ports.

On this framework Commander Damer Powell has built a most graphic and interesting account of the privateers of Bristol, their histories, their captains, and their crews, while the volume is illustrated—in addition to photographs of the few surviving dockyard models of Bristol-built ships—by reproductions of two delightful series of contemporary prints of Bristol privateers, one dating from before 1750 and the other, after paintings by Nicholas Pocock, the well-known marine artist, made some thirty years later. Happily both sets of prints are preserved in the Bristol Museum and Art Gallery. G. S. L. C.

RECOLLECTIONS OF A PRISONER OF WAR. By Lord Phillimore, M.C. *London: Edward Arnold & Co.* 1930. 8×5 *inches;* viii+312 *pages; sketch-maps.* 10*s* 6*d*

These Recollections are none the worse for having been kept on the stocks for a dozen years instead of being launched on the spate of "escapades" with which we were inundated after the War; they should make a special appeal to the younger generation of readers that has arisen since that thrilling flood. Three times did Captain Phillimore outwit his German guards; and in the course of his unsuccessful attempts to reach three different frontiers he saw a wide extent of enemy

territory, from Osnabrück to Przemyśl and from Hanover nearly (but not quite) to neutral Schaffhausen, if he can be said to have seen a country that he traversed largely under cover of darkness. These escaping heroes were up against geography in a very stern and practical form. It is a marvel that they did not get lost more often, so inadequate were the only available maps except on one occasion. That exception was due to a most, perhaps the most, daring act on the author's part; he actually bought a Baedeker of the Black Forest at a station bookstall when for a brief moment his captors' backs were turned. That Baedeker would have been a museum piece; but, alas, it had to be secretly burnt by the purchaser after one of his recaptures to avoid extra punishment. J. H. R.

THE CASE FOR THE SEA SERPENT. By Lieut.-Commr. R. T. GOULD, R.N. *London: Philip Allan* 1930. 9×6 *inches;* xii+290 *pages; illustrations.* 12*s* 6*d*

The author of 'Oddities' and 'Enigmas' has written another interesting book and one of considerable scientific merit. He has the courage to champion the "sea serpent," and he gives good reasons for his beliefs. While he disclaims any authority as a naturalist, Commr. Gould has examined the evidence from contemporary documents or living witnesses of about thirty reports of sea serpents, and concludes that there exists, though probably in small numbers, a large marine monster of a type or types quite unlike any living creature at present known to science. It is difficult, after reading and weighing the evidence, to come to any other conclusion. Of course, many of the tales of sea serpents originate in tide rips, schools of fish, dolphins, seaweed, or even hallucinations. Giant squids may explain some, giant seals, turtles, ribbon fish, and sturgeons others; but there remains the residue of cases discussed in this volume that will not yield to such treatment and for which some unknown creature must be postulated. In all these cases there is a remarkable similarity in the appearance of the creature. It is some 60 to 90 feet long, and it has a long slender neck ending in a snake-like head. The body tapers to a slender and flexible tail. The skin is smooth, dark brown above and white below. The body appears to be propelled by four flippers. The extinct *Plesiosaurus* is the creature that most nearly agrees with the living sea serpent. Commr. Gould believes that most genuine reports of the sea serpent emanate from a descendant of *Plesiosaurus* or a creature that "has evolved along similar lines." But he is inclined to believe in two other unknown creatures—a long-necked seal and a gigantic turtle-like creature. There is nothing incredible in these suggestions. It is most unlikely that any fishing-net in use would capture an animal of this size, and if the numbers are few there is little likelihood of a dead body being cast ashore, at least in a recognizable state. So seldom are whale carcases cast ashore that much doubt exists about the characteristics of several species that are not persistently hunted. It is noticeable that most occurrences of the "sea serpent" have been in the North and South Atlantic; but this may be accounted for by these waters being more frequented by European vessels than the waters of other oceans. The illustrations and diagrams add much to the interest of a volume which is essential to any unbiassed naturalist who would express an opinion on the existence of the sea serpent. R. N. R. B.

THE MONTHLY RECORD

CORRECTION TO THE ACCOUNT OF THE CENTENARY CELEBRATIONS

By an error which it is difficult to explain or excuse there was a serious omission in the account of the Centenary Celebrations on pp. 476 and 477 of the December *Journal*. On the morning of Wednesday, October 22, before the first of the series of communications on the Habitable Globe the President called upon Mr. Voûte, Secretary of the Koninklijk Nederlandsch Aardrijkskundig Genootschap, who announced that his Society desired to honour our Society and some of its prominent members by presenting the Gold Medal of the K. Nederlandsch Aardrijkskundig to Sir Francis Younghusband for his scientific work in India and to confer Honorary Membership upon Sir Charles Close and Mr. Douglas Freshfield. The shorthand writer's report accidentally omitted the name of Mr. Freshfield, who was present and received his Diploma of Honorary Membership from the hands of Mr. Voûte. The omission was unfortunately not detected when the account of the Celebrations was prepared for press for the December number of the *Journal*, and our apologies are due both to the Netherlands Society and to Mr. Freshfield.

VARIATIONS IN LENGTHS OF ALPINE AND SCANDINAVIAN GLACIERS

The International Glacier Commission, established 1894, published in 1914 its last annual report on the variations in lengths of glaciers for 1913. In 1927 this Commission was replaced by a new Glacier Commission attached to the Hydrographic Section of the Union of Geodesy and Geophysics. In order to bridge the gap since 1914 before re-instituting the annual reports, it was decided to publish as quickly as possible as many figures as could be collected for variations in the lengths of glaciers. A report has now appeared ("Rapport de la Commission des Glaciers 1930," Bulletin 14, Sect. d'Hyrol. Sci., Conseil Inter. de Recherches, Union Géod. et Géophys. Inter.) giving data for Alpine and Scandinavian glaciers from 1913–1928 collected by Professor Mercanton, Secretary to the Commission. A complementary report is in course of preparation for the other glaciated regions, for which the information, less systematic and scattered through very many publications, is taking longer to assemble. The observations in the present report, collected from a variety of sources, many of which are enumerated in the introduction, are grouped in tables giving the variations in length in metres, to the nearest half-metre. The glaciers, apart from broad grouping geographically, are classified either in mountain masses or in hydrographic basins, following the classification adopted by the observers themselves from whom the figures are taken. This report covers the period from 1913, and a little earlier in some cases, to 1928. The measurements for 1929 will be the subject of the first annual report.

BORA AND MISTRAL

Monsieur E. Bénévent, in the *Annales de Géographie* (Année XXXIX, May 1930), makes an interesting comparison between the Mistral of the Rhone Valley and the Gulf of Lions and the Bora of the Adriatic, showing in what respects they resemble one another, in what they differ, together with the underlying meteorological conditions that give rise to both. Both are cold northerly winds descending abruptly to the coast from the mountains, sometimes with such violence that they

have been known to upset a railway train, and both are most common during the winter months. The determining condition in each case is a barometric depression situated somewhere over the Mediterranean or Adriatic, and as depressions are very common in this region during the winter months with northerly winds, it really means that winds answering more or less to these designations are actually predominant, as the statistics of wind-direction clearly show.

On the other hand, mistral winds blow over a much wider extent of country than the bora, are less restricted to the winter months, and, as they derive their air supply in many cases from an anticyclone over the Atlantic, are not always cold. Bora winds are typically fed from the very cold air of high-pressure systems lying over Eastern Europe, and, in spite of dynamic warming due to their descent from the mountains, often bring freezing weather and snow to the Trieste coast. The range of the bora's violence is limited to where the mountains abut abruptly on to the coast, so that it is more strictly a local wind than the mistral, being highly "canalized" and closely governed by the relief of the land, like the "bise" of the French Alpine valleys.

Monsieur Bénévent's exposition however makes it clear that bora and mistral alike are to be regarded as topographically intensified northerly winds taking part in the general circulation of the region as governed by the disposition of high and low pressure systems, much in the same way as the warm Alpine föhn is a locally influenced southerly wind of wider origin. These are specialized cases, but in reality, of course, all weather is everywhere the product of general and local factors in the circulation of the atmosphere, and it is the constant interaction between the two that lies at the root of much of the complexity of meteorological problems.

LITTORAL CURRENT IN THE TYRRHENIAN SEA

It has long been accepted as a fact that a current entering the Tyrrhenian Sea from the Strait of Messina sweeps up the coast of Italy from south-east to north-west, forming in fact a part of the general circulatory movement in the Mediterranean, in a counter-clockwise direction, first established by Admiral Smyth in the middle of last century. Lately, it seems, some geographers have questioned whether any such continuous current along the coast of Italy really exists, and the question has been briefly re-examined by Sig. E. de Chaurand in a lecture delivered at Florence and printed in the first number of *L'Universo* for 1931. The lecturer began by considering a number of general principles governing the production of marine currents, insisting that such can only be kept going by causes constantly acting in a uniform direction. Among the causes considered—winds produced by persistent differences of barometric pressure between one region and another; persistent differences of temperature and salinity; the action of the Earth's rotation, effective through the want of cohesion between the solid shell and the superincumbent water, and others—special weight was given to the effects of rotation, the case being considered parallel to that of supposed "continental drift." Points incidentally dealt with were the formation of counter-currents and the manner in which the material on the sea-floor may—contrary to the view of some—be transported by marine currents. But actual observation of facts is of more value than any theoretic considerations, and various instances were adduced of the *results* of such a current as is postulated, in the form of transport of objects in a constant direction along the coast, as well as in many details of coast morphology such as the method of deposit of material at the mouths of rivers. By such facts the old belief in the existence of the Tyrrhenian current was held to be fully justified.

A PROPOSED LATIN ALPHABET FOR KURDISH

In the *Journal of the Royal Asiatic Society* for January 1931 (pp. 27–46) Mr. C. J. Edmonds makes some "Suggestions for the Use of Latin Character in the Writing of Kurdish." After noticing certain methods of writing Kurdish in Arabic characters, which are as unsuited to that language as they were to Turkish, the author proceeds to set forth his own scheme which, being intended for every-day use, has tried to avoid invented letters and diacritical marks. In pursuing this laudable object however he has had recourse to several regrettable expedients. He defends his *c* for the sound of English *j* on the reasonable ground that the Turks have adopted it; but that is as far as he goes in copying Turkish usage. The sound of the purely Arabic letter ح (hard *h*), which with ع (') and ق (*q*) were "taken over by the Kurds in rather softened form with the Arabic words containing them," is rendered by the letter *x*; it is a little difficult to see how there can be room for sufficient difference between the sounds of a softened ح and of the letter ه (soft *h*) to justify the rejection of *h* for the former in favour of the "exotic-looking" *x*. The combinations *th*, *ch*, *kh*, *dh*, *zh*, *sh*, *gh* are used in a more or less normal way; but *rh* and *lh* represent rolled *r* and velar *l* respectively. The latter has the same sound as the Russian hard *l*; it is unfortunate that *lh* with its Portuguese associations suggests the very opposite, a liquid *l* (or *ly*). The treatment of the vowels is seriously open to criticism. The letter *e* represents (as in Magyar) the sound of *a* in *bat* (R.G.S. II, *ä*), *a* being always the ordinary long *a* as in *father*. The lengthening of *i* and *u* is shown by doubling these letters, viz. *ii* and *uu*, both very liable to be misread, the latter especially when in combination with the letters *m* or *n* (as in *nuun*, the name of the letter *n*) and the former owing to its close resemblance to the letter *ü* which is very properly used with its German and Turkish value (though the sound is a provincialism not found in Sulaimani Kurdish). For the sound of German and Turkish *ö* the awkward combination *uy* is employed, while *y* by itself represents the neutral vowel with the result that *j* has to be used to give the sound of consonantal *y* (as in *yes*). Mr. Edmonds optimistically hopes that no one will be disposed to quarrel with this arrangement; but it can hardly fail to dismay those who have been trying for years to get rid of the German *j* as far as possible in the spelling of place-names for British use. The only recourse to a diacritical mark in the system is in the case of the letter *ê*; it is not quite clear what sound this represents, but it is probably the diphthong *ei* as in *rein*.

As the system is only intended for use in the territory of ex-Turkish Kurdistan which has been added to 'Iraq, it might have been expected that the 'Iraq Government's method of using Latin characters would have been taken into consideration. In the 'Iraqi transliteration of Arabic, the letters *y* and *j*, for example, have their ordinary English values and the long vowels are marked with the sign ¯ in the normal way. It is difficult to see the advantage of writing Slêmanii for Sulaimānī—or Sleimānī, if that is the Kurdish pronunciation; the name Hasan is almost unrecognizable as Xesen. It should be added that Mr. Edmonds gives three fairly long pieces in Kurdish (with a translation) to illustrate the working of his system. It is clear that he is no mean scholar in this little-known language; our only quarrel is with his system of representing sounds. Would not the well-established R.G.S. II System have met the case, with the possible addition of *rr* and *ll* to distinguish the rolled and velar sounds of *r* and *l* respectively? The pronunciation of Kurdish does not appear to present such startling peculiarities as to justify an unfamiliar treatment of the Latin alphabet.

CHANGES OF PLACE-NAMES IN EAST PERSIA

We have been informed by the Foreign Office that the town of Nasratabad, in Seistan, is in future to be known as Shahr-i-Zābul, that is, the Town of Zābul. This name Zābul, which was traditionally that of the birthplace of Rustam, originally denoted the territory of which Ghazni in Afghanistan was the capital; but the term has been applied to different tracts of country at different times and is now, we understand, to be regarded as synonymous with Seistan.

We are further informed that the name of the town of Duzdāb has been changed to Zāhidān. This name may come from a ruined city of Seistan lying about 12 miles east-south-east from Nasratabad and said to have been laid waste by Tamerlane. Duzdāb lies about 112 miles south-south-west from Nasratabad and has come into prominence as the terminus of the North-Western Railway of Baluchistan. Duzdāb means "Thief Water" and Zāhidān "Hermits."

FRENCH PROGRESS IN MAURITANIA

Last year an important step was taken by the French authorities towards the pacification and control of Northern Mauritania, the desert or semi-desert tract between Southern Morocco and the Senegal, notes on the geology of which, by the late Professor Schwarz, appear elsewhere in this number of the *Journal* (pp. 238–245). Although the nomadic character of the native tribes has for some years brought them into contact with the French, their elusive habits and the waterless nature of much of the country has made it difficult to hold them in restraint, and though under General Gouraud the Western Adrar was conquered, and the mountain knot of Ijil with the adjacent salt pans reached, so far back as 1910, no permanent occupation was then possible, and the French posts remained exposed to raids from the tribes farther inland. In January 1930 an expedition to Ijil with motor transport, supported by a camel-corps escort, was successfully carried out by the Governor of Mauritania, M. Chazal, accompanied by Col. Dardenne and other officers, and is briefly described in *La Géographie*, July–August 1930. The value of motor transport was once more brought out, a convoy of thirteen lorries reaching Atar, the headquarters of Adrar, in four days from St. Louis, though a month was the time previously required for the journey by the ordinary caravans. Atar lies on the northern slope of the rocky plateau of the Dhar, which blocks communication with the interior of the Sudan and brings Adrar rather into the Moroccan sphere of influence. The plateau falls by a succession of terraces to a wide plain traversed by lines of dunes, and the route from Atar to Ijil passes over this, skirting the border of the higher ground, as is well brought out in the sketches accompanying the article. Without previous preparation of the ground the distance from Atar to Ijil was covered in three days and a half, and this may be slightly reduced, bringing Ijil within seven days of the Senegal. It is expected that a through route may soon be opened to the French territories in the north, from which direction, as well as from the south farther inland, an advance has also been made recently.

DESERT VARNISH

In the *American Journal of Science* for January 1931 Mr. J. D. Laudermilk discusses certain incrustations on rocks in the Mojave Desert, California. "Desert varnish" is the term commonly applied to the dark brown and black coatings of iron and manganese oxides frequently occurring on the rocks of the desert regions of the south-western United States. The deposit is similar to others reported from different parts of the world where periods of excessive dryness alternate with intervals of rainfall. In South-Eastern California and Arizona the varnish occurs upon all the rocks of certain localized areas. It may cover entire outcrops

on their exposed surfaces, or scattered boulders on a hillside, or it may be restricted to flat circular areas on low ground. Rocks having the coating are of various kinds, and the effect is always to give them a curious artificial appearance. They are generally coated with the deposit on their upper surfaces and sides only. The under surface resting upon, or embedded in, the sand is, excepting in the case of small pebbles, uncoated with the varnish and generally shows a warm reddish brown colour. Near the margin of the coating dendritic figures often occur, and light is thrown on their origin by the production of artificial "dendrites" in the laboratory from iron and manganese solutions. The author's observations lead him to the conclusion that the active agent in the formation of the varnish is a microscopic lichen growing on rocks having a manganese and iron content. The lichens secrete certain acids and the end of a succession of chemical changes is a solution of iron and manganese oxides which during rains are distributed by capillary action on surrounding surfaces and also carried to other rocks which may have no manganese content. Finally during the dry weather the intense heating to which the rocks are subjected causes the transformation of the hydroxides into anhydrous desert varnish.

ICE CONDITIONS IN THE NORTH ATLANTIC 1929

Early in 1914 the United States Government, at the invitation of the International Conference on Safety of Life at Sea held in London in January of that year, undertook to establish a system of ice observation and patrol in the North Atlantic. Since then an ice patrol has been maintained each year, except in 1917 and 1918, by the U.S. Coast Guard. The area covered is that subject to icebergs drifting south past the Newfoundland Banks across the great shipping lanes between Europe and America. The greatest volume of traffic, and the fastest, passes round the Tail of the Banks, well south of the usual limits of field ice, and, dangerous as this ice is to shipping passing north of the forty-seventh parallel, it is, when compared with icebergs, relatively short lived, even along the northern shipping tracks crossing the Banks. The patrol therefore, while collecting and broadcasting information as to conditions both of field and berg ice over a wide area, confines most of its attention to bergs drifting south of the forty-eighth parallel down the east side of the Grand Banks, and particularly to a very critical area, shaped roughly like an equilateral triangle, south and east of the Tail. The side of this triangle is about 175 sea miles long, and its corners near 41° 30′ N., 47° 00′ W., 41° 30′ N., 51° 00′ W., and 44° 48′ N., 48° 00′ W. The southern limit of melting of the bergs, and so of the patrol's wide field of work, is about 40° 30′ N. lat.

The yearly reports of the patrol, published as a bulletin by the U.S. Treasury Department, U.S. Coast Guard ('International Ice Observation and Ice Patrol Service in the North Atlantic'), give much interesting information, in text and charts, as to conditions during the preceding season, together with meteorological and oceanographic data collected by the patrol vessels themselves and by other vessels reporting to them. Bulletin No. 18, for the season of 1929, shows that this year was one of unprecedented severity in the history of the ice patrol. Ice was late in appearing off the Grand Banks—the vessels did not leave for the patrol until the unusually late date of April 1—but once it came south it proved exceptionally heavy and persistent and the season lasted until early in August, twenty days longer than in 1925, hitherto regarded as the record year. The number of icebergs which drifted south of the forty-eighth parallel during the year was also remarkable, being estimated at approximately 1300. The figure for June alone in 1929 nearly equalled that of 380 for an average year, and that for May surpassed it. Field ice and berg conditions were so bad early in the

season that the shifting north of the Canadian routes for shipping from "D" tracks, round the Tail, to "E" tracks, across the Banks, was postponed till a late date in April, and even then many vessels kept 80 to 100 miles south of the "E" tracks so as to pass round the southern end of the field ice. Throughout the season temperature values for the surface water were 2° or more below the average in most of the patrol area north of the forty-second parallel, which probably contributed to the unusual persistence of the icebergs.

The large number of bergs south of the forty-eighth parallel claimed most of the patrol's attention in 1929 in the practical working of scouting, trailing, and broadcasting, and though the vessels were as usual equipped for oceanographic investigation, this side of their work was necessarily limited. Sonic soundings were however frequently taken and a series of charts and diagrams in the report summarize the temperature, salinity, and current data collected. Certain comments and conclusions reached are interesting. Surface isotherms as a basis for predicting iceberg drifts are discussed. South-east of the Banks very marked embayments occur in the boundary between the cold and warm currents, especially in June, and local currents are as a rule accelerated along the adjacent intensified temperature walls. Taking various factors into consideration, it is estimated that in an ordinary year any 50-foot stratum of water in the cold current is not chilled more than 0·01° F. by the melting of ice which drifts south of the forty-eighth parallel. On the other hand the total effect of solar warming, between March 25 and July 4, of the first 50 feet of surface water in the "melting area" off the Banks is estimated at 12° F., or the average rise per day at 0·12° F. The total chilling effect of the melting ice is therefore regarded as negligible. Interesting information is also given on the disintegration of icebergs, both natural and artificially assisted.

VALUABLE GIFT FOR THE MAP COLLECTION

The Society's collection of early atlases has received a valuable addition through the generous gift of Miss Ursula Cust, in memory of her brother, the late Sir Charles Cust, G.C.V.O., for some years a Fellow of the Society. The two specimens thus given are among the most highly prized productions of the late sixteenth century. The first in date is the "Theatrum" of Ortelius as issued in 1571, containing the same fifty-three maps as in the first edition (or editions) of 1570, the modifications of the text being of trifling importance, so that in all essentials the issue of 1571 represents the Atlas as it first left the hand of the cartographer. The present copy is in unusually sound condition throughout and is in a most attractive binding of old dark red morocco. The other Atlas is that masterpiece of English sixteenth-century map-making, Saxton's collection of maps of all the English counties. This, too, is in splendid condition, in an old binding of brown calf. A copy in the true original make-up is rarely met with nowadays, but as all the maps but one are here on the same paper—the exception being on paper commonly found in other copies—there is little doubt that we have the Atlas practically in the form in which it was originally sold. As with one of the copies at the British Museum (and also one at Sion College) the maps are interleaved with blank sheets, no doubt intended to permit an owner to add notes, and these too are shown by the watermark to be of contemporary paper, as precisely the same mark appears on the maps themselves in some copies.

The great variety of paper seen in the early issues of the Atlas makes it pretty clear that the maps were being constantly reprinted as called for, but the order of issue of the various early impressions is very uncertain. It is therefore of interest to note the paper used in as many copies as are available for comparison. The marks in all the six copies in the British Museum were noted by Mr. Chubb in his

work on the Atlases of the British Isles, and it is interesting to find that none of these copies has paper like that of Miss Cust's copy, nor is this to be matched in either of the early issues previously owned by the Society, one given by Mr. Yates Thompson, the other (consisting of a nearly complete set of the maps without frontispiece or tables) in the William Burton volume given by Mr. Cadbury. The mark most commonly seen is that of the bunch of grapes (Burton set), but a mark found in one of the Museum copies and in the Yates Thompson copy is that of the large crossed arrows. The paper in the present copy (which is of the first quality—stout and firm) has the mark of the Strasbourg arms (Bend on a shield surmounted by a Fleur-de-lis), but though this is not so often seen in the Atlas it does not imply an appreciably later date, for it is met with in various English and foreign documents in the last decades of the sixteenth century, in which the issue of this copy may tentatively be placed. The portrait of Queen Elizabeth, which forms the frontispiece, and which, as usual, is rather gaudily coloured, bears the mark of the grapes, but the preliminary tables, present in facsimile only in the Yates Thompson copy, are on the same paper as the maps. Unfortunately the page with engraved coats of arms is missing—the only defect in an otherwise exceptionally fine specimen of Saxton's masterpiece.

E. H.

BIBLIOGRAPHY OF DR. ALBERT GÜNTHER

As keeper for many years of the Zoological Department of the British Museum, Dr. Albert Günther was brought into close association with travellers in all parts of the world, whose collections were examined and described by him or under his direction. His writings were so numerous that in a recent bibliography compiled by his son, Dr. R. T. Gunther, and printed last year as a supplementary number of the *Annals and Magazine of Natural History*, the chronological catalogue of them, spread over the years 1853–1910, covers some forty pages. Dr. Günther's work naturally led him to deal with problems of geographical distribution, and students of this branch of zoology will find the bibliography especially useful through the care taken to supply a regional key, in which the individual items are grouped by continents and their subdivisions, under the main headings of Land, Island, Marine, and Fresh-water Faunas.

BIBLIOGRAPHIE GÉOGRAPHIQUE, 1929

The 'Bibliographie Géographique,' vol. 39, 1929, is now ready, and orders should be sent to the Chief Clerk, at the House of the Society. The price of the volume, for the British Isles and Dominions, is 8*s*. 6*d*., post free, if ordered from the Society. The volumes from 1924 can also be obtained at the same price. It would simplify distribution each year if subscribers would give a standing order. Though the number of copies supplied through the Society has increased somewhat, it is still below what the value of the bibliography to geographical students warrants, and geographers would assist the Society in its undertaking by making it more widely known. It is published by the 'Association de Géographes français,' with the cooperation of this and other Geographical Societies. Its scope is wide, and the more important books and articles are analysed. The current volume, of 686 pages, contains 3045 classified entries, many of them giving ten or more references to work done in 1929.

OBITUARY

LE MARÉCHAL JOFFRE

In the dark days of 1916 Marshal Joffre did our Society the honour of accepting the proposal of the Council that he should be numbered among our Honorary Corresponding Members, and we have been proud to include for fourteen years his distinguished name in the list which precedes our List of Fellows. He was chosen in grateful recognition of his eminent services in the Allied cause: services which lay in a region far above the scientific domains of his comrades in the list, and need no recapitulation here. On the news of his death the Council desired the President to convey in the name of our Society to Madame la Maréchale Joffre an expression of high appreciation and profound sympathy, and at the Evening Meeting of January 12 the President referred in sympathetic words to the loss which the Society had sustained.

DR. ALFRED PERCIVAL MAUDSLAY

The Society has lost one of its most distinguished and devoted Fellows by the death of Dr. A. P. Maudslay, at Morney Cross, his home near Hereford, on Thursday January 22. He had been a Fellow of the Society for more than forty-six years, Member of Council, Honorary Secretary, and Vice-President; and he was an Honorary Fellow of Trinity Hall, Cambridge. During the last six months his health had failed rapidly, and to his great regret he was unable to attend the Centenary celebrations in October last. On January 27 his ashes were buried in the crypt of Hereford Cathedral beside those of his first wife, after a service in the Nave, at which Mr. W. L. Sclater and the Secretary represented the Society. We shall hope to publish in due time an appreciation of his great contributions to science.

ALFRED ERNEST YOUNG

By the death of Mr. A. E. Young, on 30 December 1930, the Society has lost a Fellow who in spite of grave ill-health had been able during the last ten years to make some remarkable contributions to the theory of Map Projections. He was born at Seaham Harbour on 4 February 1869, and educated privately and at the City and Guilds Engineering College, South Kensington, where he obtained the John Samuel Scholarship as the best student of his year, and passed out at the head of the Engineering and Mathematical Sections in 1890. After a year in the works of Messrs. Tangye at Birmingham he was appointed to the Trigonometrical Survey of Perak, where he served for twenty years as chief computer, surveyor, and finally Deputy-Surveyor-General in charge of the Trigonometrical Branch of the Federated Malay States Surveys. During his service in these States his work was of high order, and in particular he did much to develop the method of accurate traverses, which he maintained was in tropical countries more accurate and much more useful than triangulation. He would have preferred to measure the Great African Arc of Meridian by standard traverses.

After twenty years of tropical service his health broke down and he retired on pension in 1912, with the resolve to devote himself to research in his special subjects. Thus it came about that when in 1916 he offered himself as a volunteer in the war activities of our Society he was naturally at once turned on to investigating some questions of map projections: whether the projection of the International Map would serve for maps of the same linear dimensions on the scales

of 1/2M and 1/4M. Becoming intensely interested in the subject, he devoted to it his rather rare intervals of health, and in 1920 was able to publish 'Some Investigations in the Theory of Map Projections,' which was the first of the R.G.S. Technical Series.

In the hope that his health had been restored by an operation, Mr. Young applied to the Colonial Office for re-employment, and was made Surveyor-General of Jamaica in 1921, but neurasthenia returned and compelled him to resign within a year. From that time he lived in England, resuming as health permitted his studies of map projections, which culminated at the end of 1929 in his discovery of what he believed to be the most general form of orthomorphic projection with average error a minimum. His communication on this subject to the Section of Geodesy at the Stockholm meeting of the International Union was briefly described in *G.J.*, vol. 76, 1930, p. 346. It was his ambition to see this generalized theory published as a supplement to his earlier investigations, and we hope that it may be possible to find it among his papers in a form sufficiently complete.

At the Stockholm meeting he was far from well, but made some recovery during a journey in Central Europe during September. Then it seems that his health failed rapidly, and he died on December 30 at Gibraltar Cottage, Tunbridge Wells, leaving a widow and two young children. He had been a Fellow of the Society since 1903. A. R. H.

MEETINGS: SESSION 1930–1931

Sixth Evening Meeting, 26 January 1931. The President in the Chair

Elections: Copley Amory; Mrs. Jean Banks; Aubrey Louis Bickford-Smith; Alleyne Brown; Albert John Bowen Budge; Walter James Dearnaley, M.A.; Edgar Osbert Giffard; Hugh Wollen Harrison; Miss Eleanor Hughes; Sir James Leigh-Wood; George Frederick Morrell, F.R.A.S.; John M. Morris; William Atmore Norris; Frank Emmerson North; Terence William O'Hara; Philip Arthur Godfrey Phillips, M.A.; Major Guy S. Rowley; Max Seligman; E. Stanjer; E. Gerald Stanley, M.S., M.D., F.R.C.S.; Norman Wilde Taylor; Lieut. Harold Taylour; George Arthur Thorne, B.S.; Col. Bertram James Walker, C.M.G., D.S.O.; David Henry Watkins, M.A.

Paper: The East African Lakes. By Mr. L. S. B. Leakey

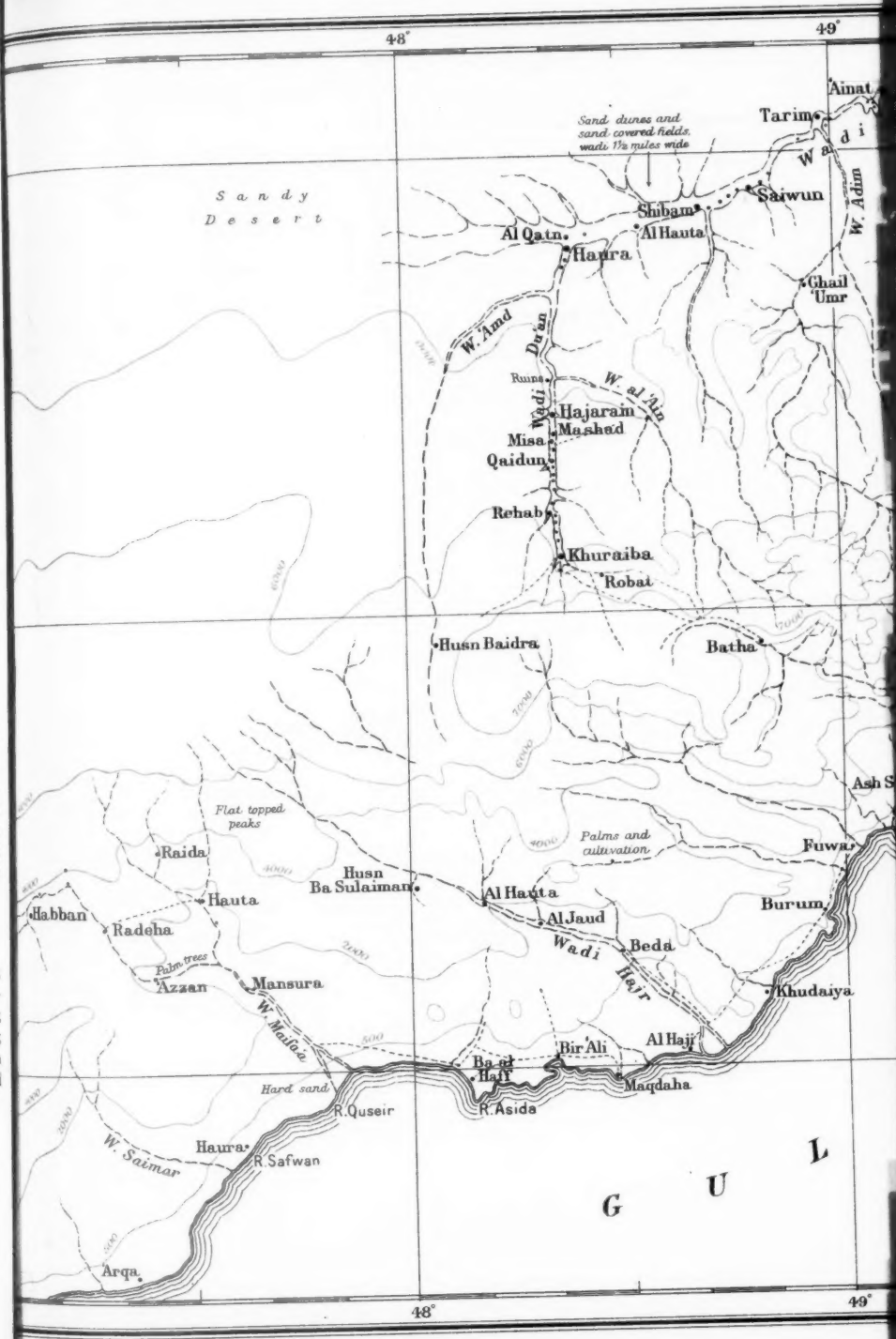
Seventh Evening Meeting, 9 February 1931. The President in the Chair

Elections: Mrs. Dorothy Irving Bell; Leonard William Berry, M.A., F.G.S.; Charles Ernest Pelham Brooks; George Askew Carr; Miss Theodora Eyton-Jones, F.R.E.S.; Ulric John Gilder; Robert Charles Arthur Stanley Hobart, I.C.S.; Paul L. Hoefler; Miss Kathleen Howard; Robert Thackray Morrison, B.A.; Charles James Sawyer; Kenneth Graham Thomson; John Henry Walker; John Henry Wilde, B.SC.; Charles Llewelyn Carrick Williams; Major Charles Reginald Williams, D.S.O., M.C., F.Z.S.

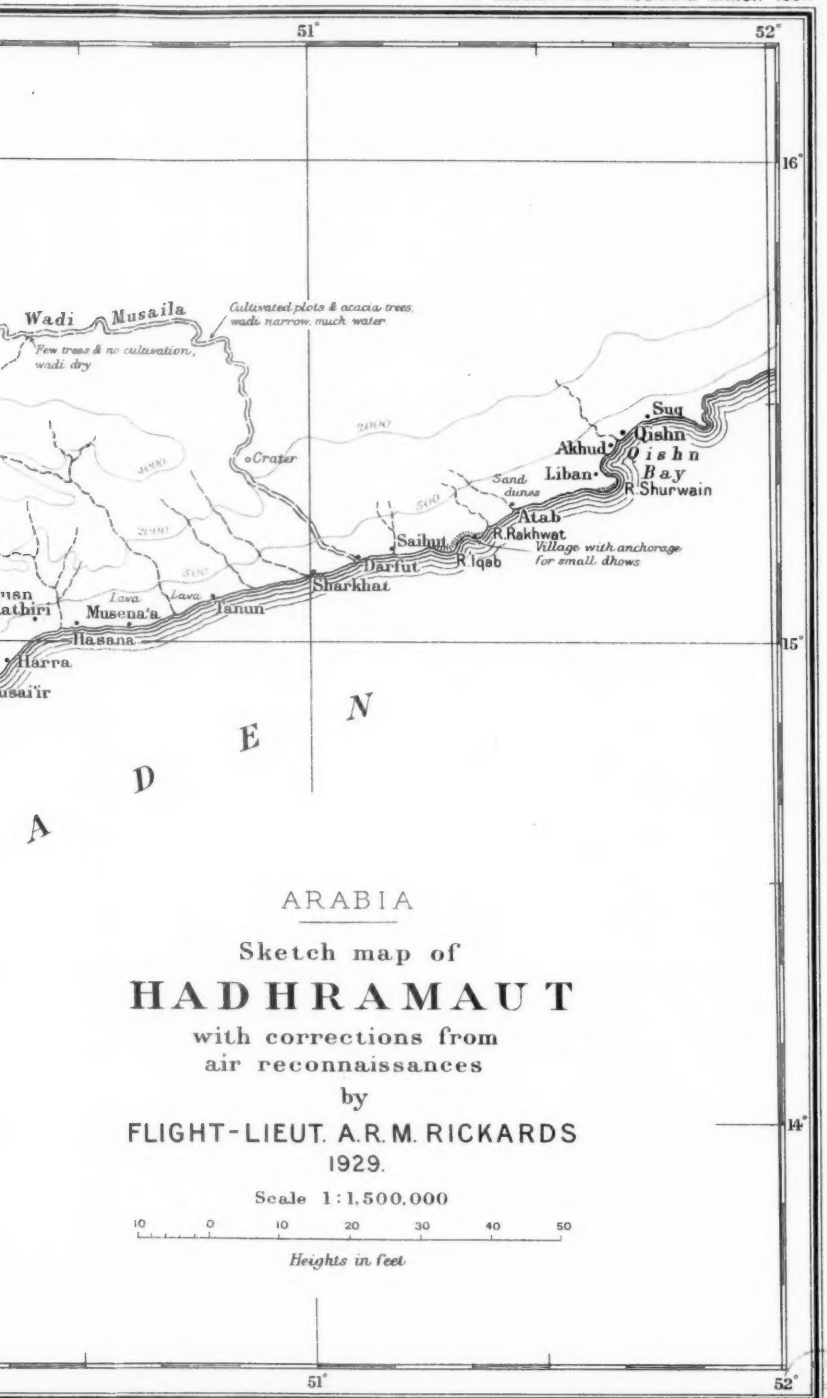
Paper: A Journey to Lake Chad and the Sahara. By Mrs. Patrick Ness

Fourth Afternoon Meeting, 16 February 1931. The President in the Chair

Paper: Land Utilization Survey. By Dr. L. Dudley Stamp


48°
49°
Sandy Desert
Sand dunes and sand covered fields, wadi 1½ miles wide
Ainat
Tarim
Wadi
W. Adim
Shibam
Saiwun
Al Qatn
Al Hauta
Haura
Ghail 'Umr
W. Amd
Duan
Wadi
Rums
W. al 'Ain
Hajarain
Mashad
Misa
Qaidun
Rehab
Khuraiba
Robat
Husn Baidra
Batha
Ash S
Flat topped peaks
Raida
Palms and cultivation
Fuwa
Husn Ba Sulaiman
Al Hauta
Hauta
Habban
Radeha
Al Jaud
Burum
Wadi Hajr
Beda
Palm trees
Azzan
Mansura
W. Maifa'a
Khudaiya
Bir Ali
Al Hajr
Ba'al Haif
Maqdaha
Hard sand
R. Quseir
R. Asida
W. Saimar
Haura
R. Safwan
G U L
Arqa

Published by the Royal Geographical Society.



ARABIA

Sketch map of

HADHRAMAUT

with corrections from air reconnaissances by

FLIGHT-LIEUT. A.R.M. RICKARDS

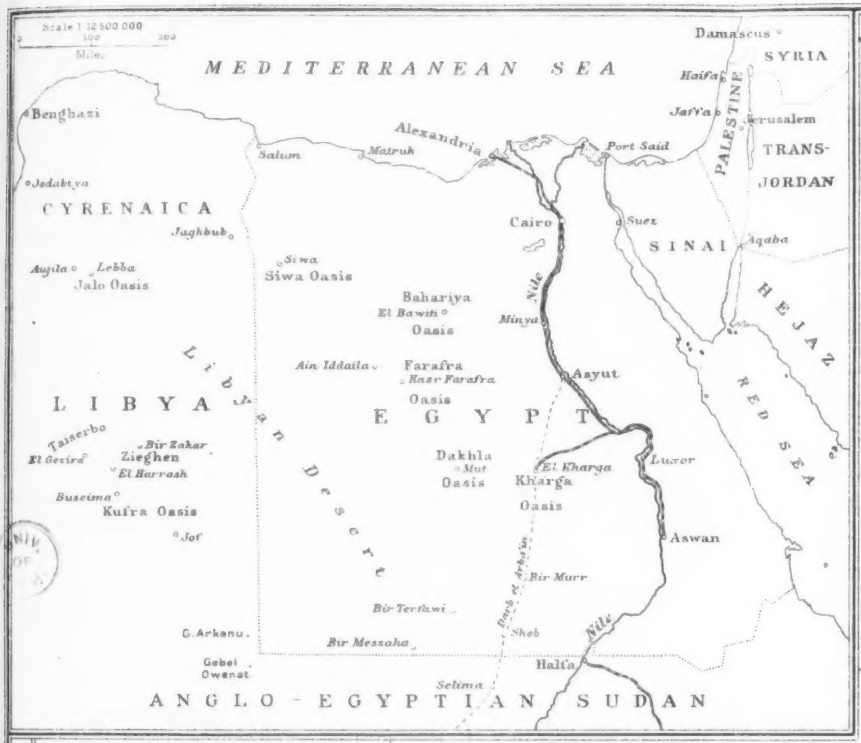
1929.

Scale 1:1,500,000

10 0 10 20 30 40 50

Heights in feet

HADHRAMAUT
Cochrane & Rickards



28

EGYPT

Part of the

LIBYAN DESERT

Showing the route surveys

of

H. J. L. BEADNELL

1927 and 1928

Scale 1:2000000

10 0 10 20 30 40 50

Statute Miles

10 0 10 20 30 40 50 60 70

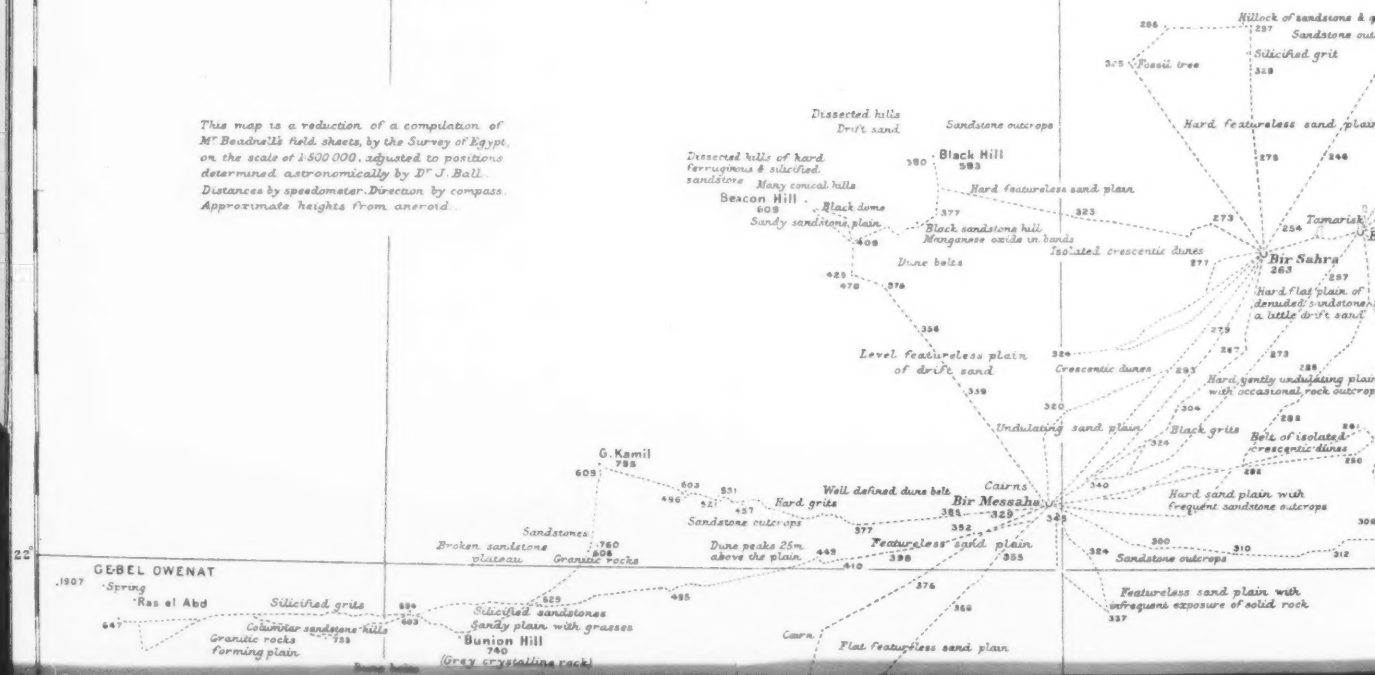
Kilometres

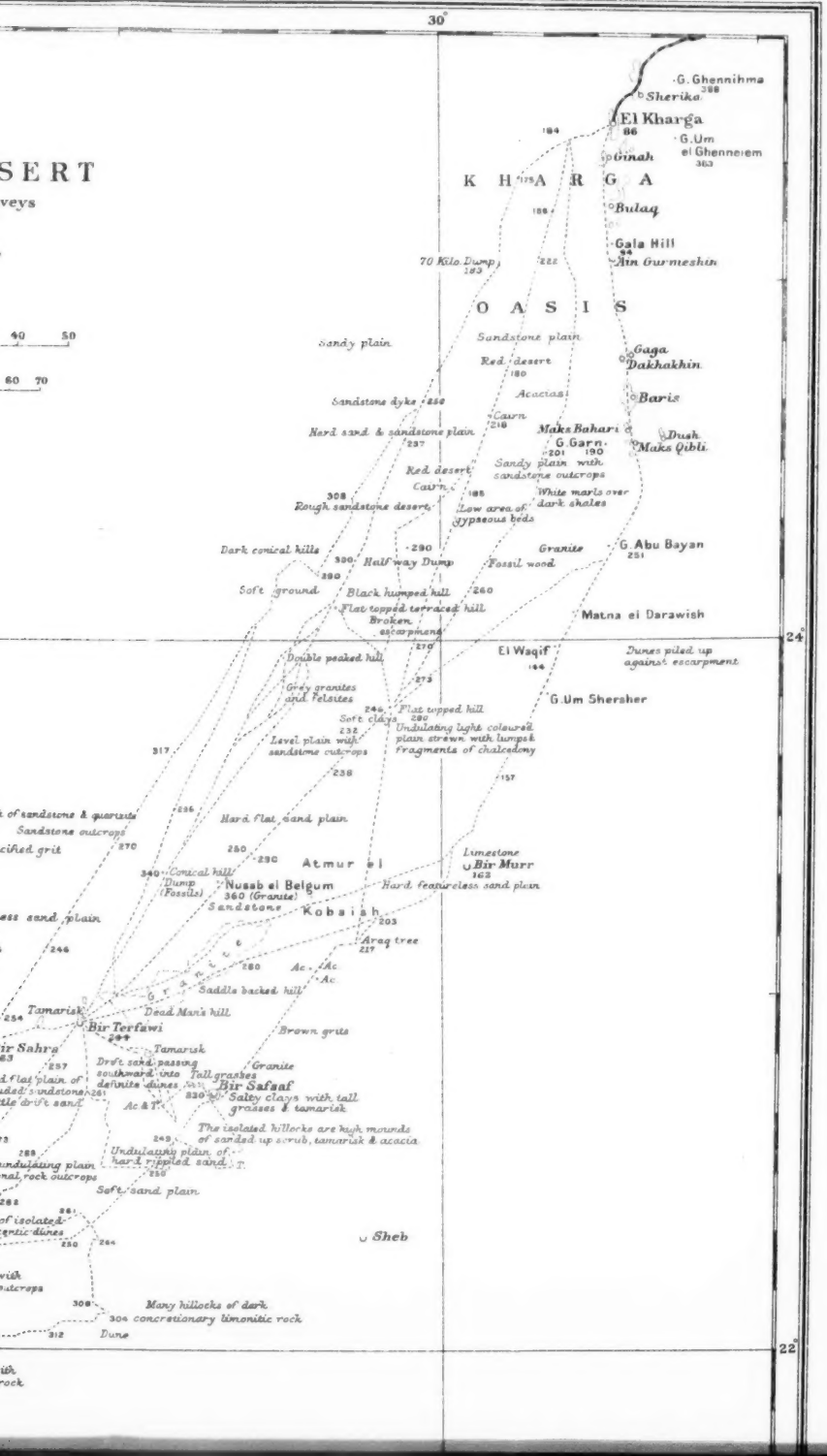
Routes .....

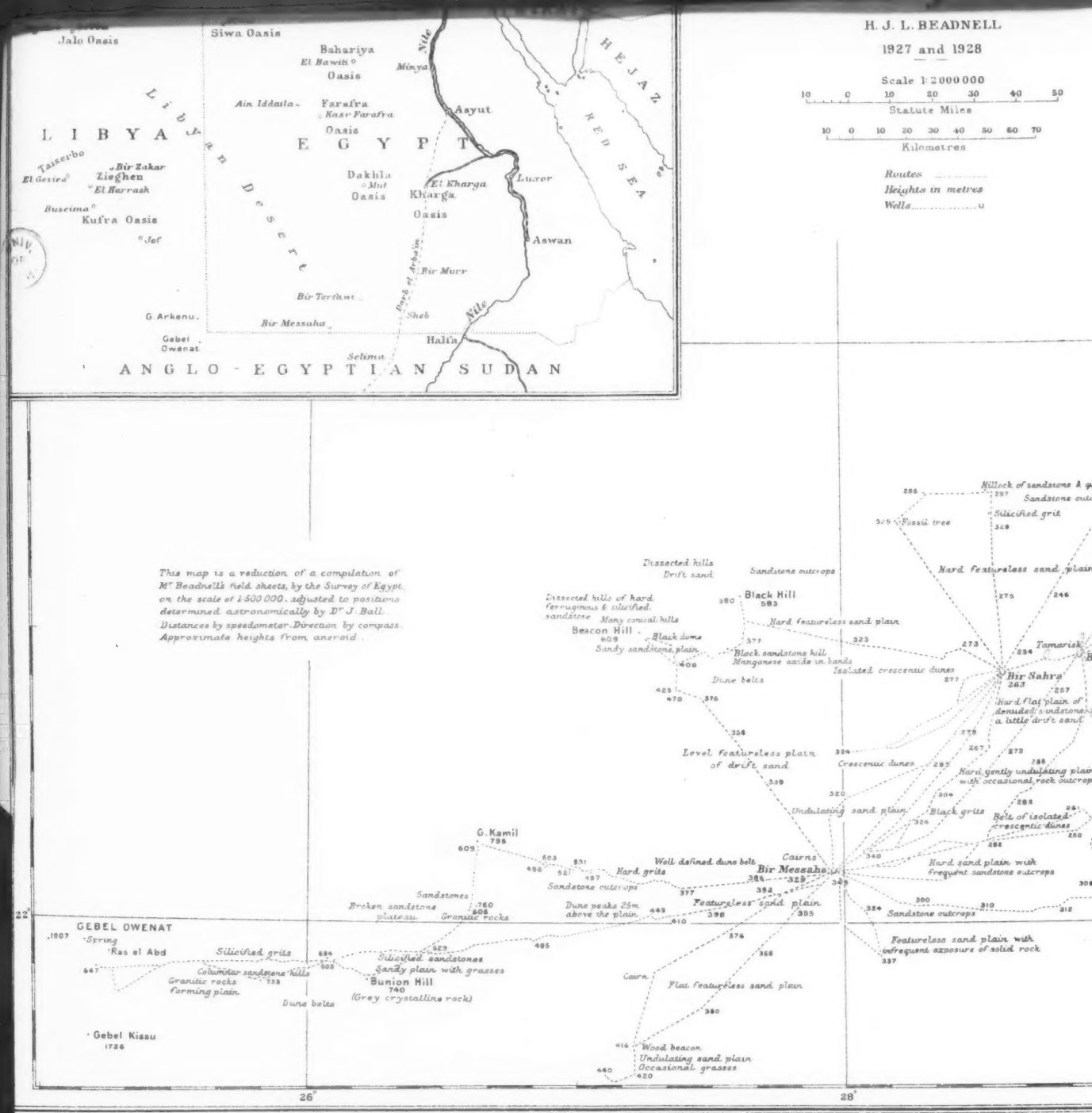
Heights in metres

Wells .....o

This map is a reduction of a compilation of Mr Beadnell's field sheets, by the Survey of Egypt, on the scale of 1:500 000, adjusted to positions determined astronomically by Dr J. Ball. Distances by speedometer. Direction by compass. Approximate heights from aneroid.




30°
G. Ghennihma
388
Sherika
El Kharga
86
G. Um el Ghenneiem
363
Ginah
K H A R G A
Bulaq
Gala Hill
Ain Gurmeshin
70 Kilo. Dump
O A S I S
Sandy plain
Sandstone plain
Red desert
Gaga
Dakhakhin
Acacias
Baris
Sandstone dyke
Cairn
Hard sand & sandstone plain
Maks Bahari
Dush
G. Garn
Maks Qibli
Sandy plain with sandstone outcrops
White marls over dark shales
Rough sandstone desert
Low area of gypseous beds
Granite
G. Abu Bayan
Dark conical hills
Half way Dump
Fossil wood
Soft ground
Black humped hill
Flat topped terraced hill
Broken escarpment
Matna el Darawish
24°
El Waqif
Dunes piled up against escarpment
Double peaked hill
Grey granites and Felsites
G. Um Shersher
Flat topped hill
Soft clays
Undulating light coloured plain strewn with lumps & fragments of chalcedony
Level plain with sandstone outcrops
Hard flat sand plain
Sandstone outcrops
Atmur el
Limestone
Bir Murr
Conical hill (Dump) (Fossils)
Nusab el Belgum (Granite)
Hard featureless sand plain
Sandstone
Kobaish
Araq tree
Saddle backed hill
Tamarisk
Dead Man's hill
Bir Terfawi
Brown grits
Tamarisk
Drift sand passing southward into definite dunes
Granite
Tall grasses
Bir Safsaf
Salty clays with tall grasses & tamarisk
The isolated hillocks are high mounds of sanded up scrub, tamarisk & acacia
Undulating plain of hard rippled sand
Soft sand plain
Sheb
Many hillocks of dark concretionary limonitic rock
Dune
22°



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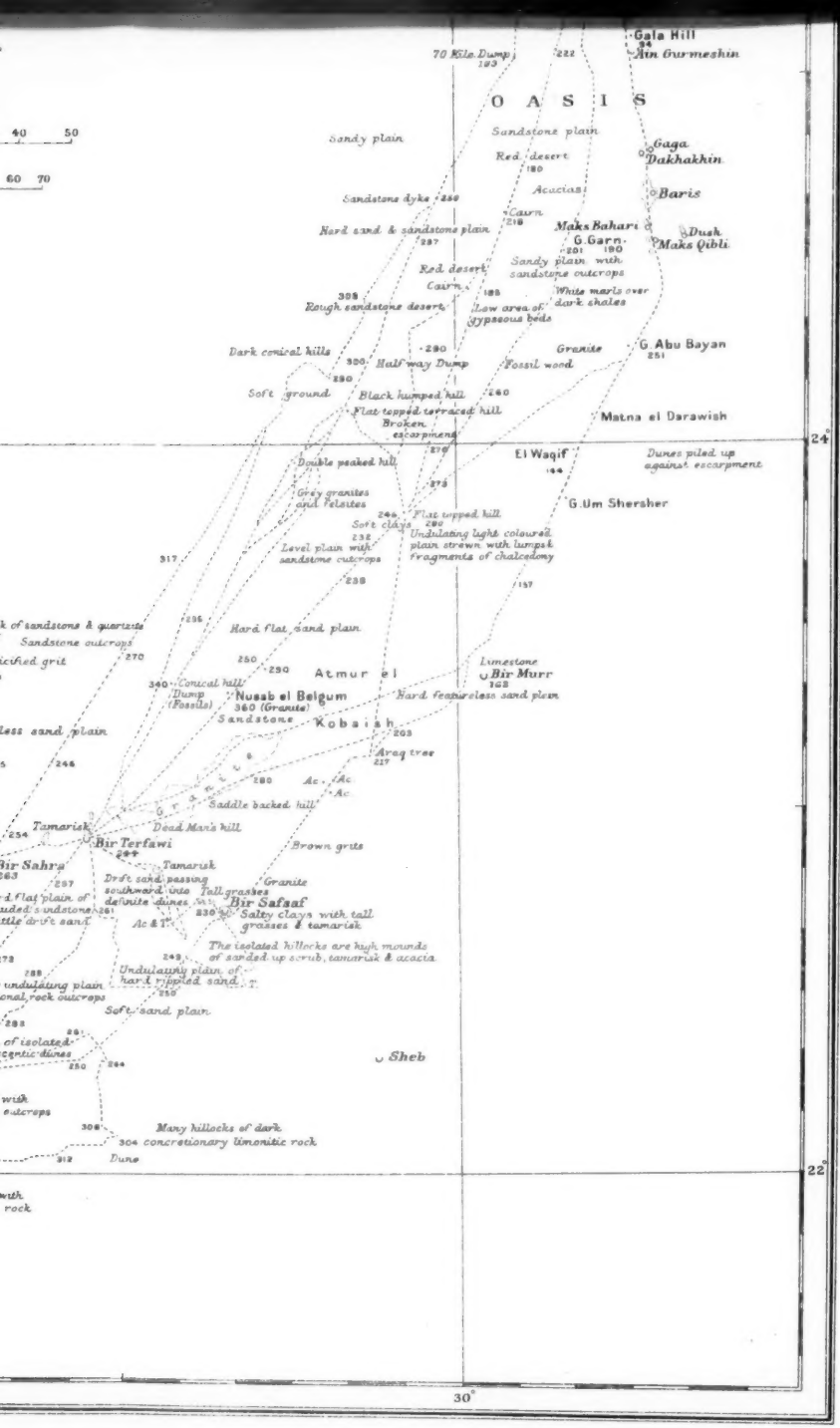

LIBYAN DESERT
Beadnell